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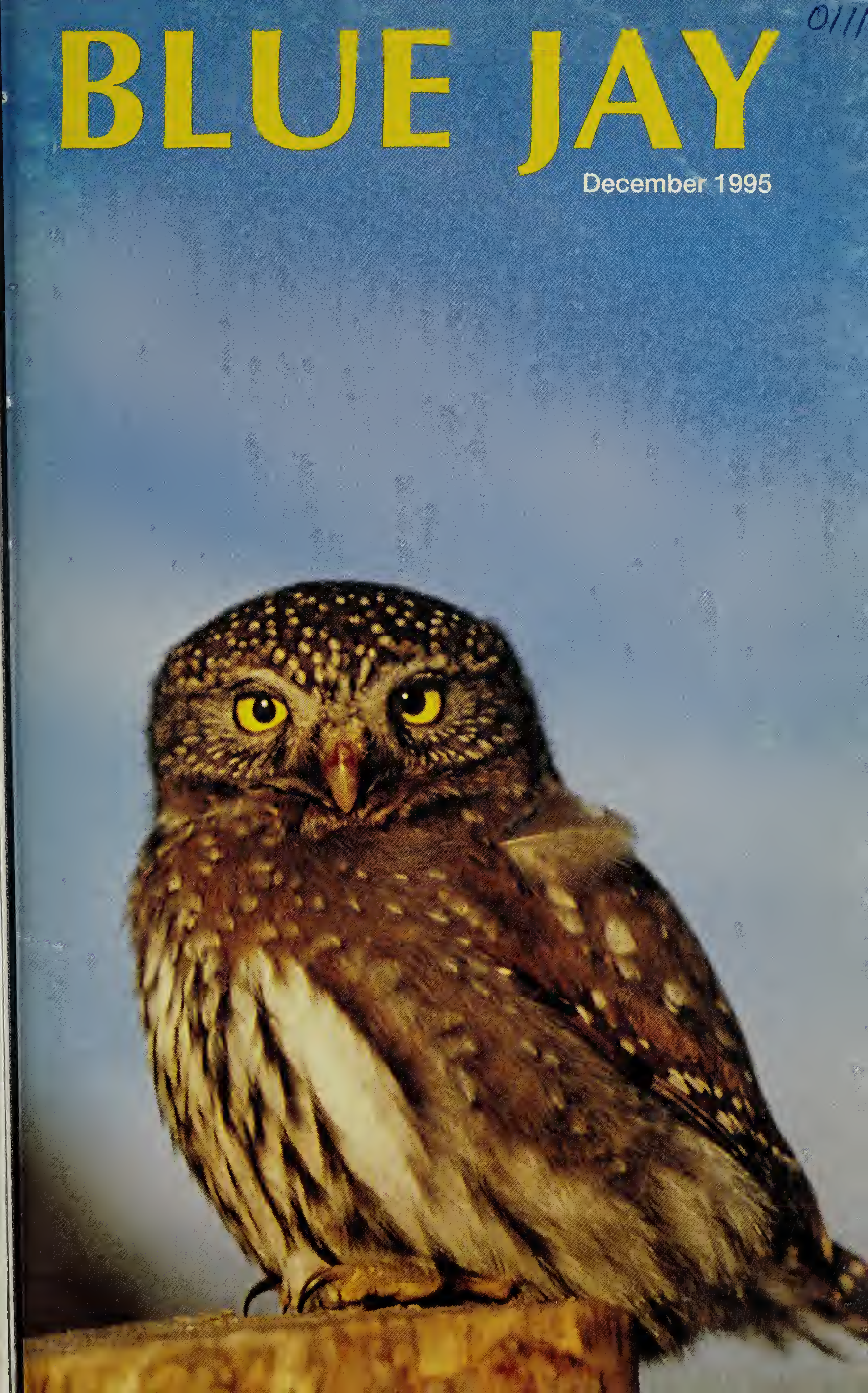
BLUE JAY

December 1995



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MAY -7 1996

EDITOR'S MESSAGE

This final issue of *Blue Jay* Volume 53 is the third issue under my editorship. I am becoming comfortable with the publication process and have the editorial and review process fairly well in hand. The main factor that threatens to keep *Blue Jay* behind schedule is a lack of material — articles, notes, letters, photographs. For a relatively small publication *Blue Jay* swallows up a lot of words each issue!

Consider sending in an article or note on that natural history observation or project that you've been meaning to document all this time. As can be seen, by examining the last three issues, there is a place for everything in *Blue Jay*. I would especially like to receive botanical, fish and herpetological material. These are areas of natural history that *Blue Jay* has under-treated in the past, due to a dearth of such submissions not because of editorial veto. Reprinted in this issue are Guidelines for Authors to aid in proper formatting of material. Please remember that a digital copy in WordPerfect 5.1 or compatible format is absolutely essential.

The *Blue Jay* seems a natural venue for "gazetting" rare natural history sightings in Saskatchewan. I would invite the submission of rare sightings of any species of flora or fauna in the province. Documenting photos will significantly enhance records and are strongly encouraged.

On the subject of pictures, *Blue Jay* relies on a photo file which has been built up through donations over the years. If you have photographs of any plant, animal or habitat please consider sending a copy. It is hard to predict precisely when a photo will appear in *Blue Jay* but you can be assured that over time your photos will be used. Additionally, photos for the cover of *Blue Jay* are always required. If you have a photo you are particularly proud of, send it in for consideration. All submissions will be acknowledged and photos judged unsuitable will be returned promptly.

Thanks for your patience over the last year as I have struggled to get up to speed as the editor of *Blue Jay*. I look forward to your support, especially in the areas discussed above, as I work towards producing four stimulating issues of *Blue Jay* in 1996.

Sincerely,
Douglas M. Collister

HABITAT

THE FASCINATING FESCUE

BERNIE GOLLOP, 2202 York Ave., Saskatoon, SK. S7J 1J1

That wasteland of unruly grasses, patchy brush and scruffy aspen bluffs on the edge of town is not the boring site it might appear from a distance. A closer look will reveal it is a beehive of activity, a fraction of which is described in this article.

This is a weekly account of selected observations on the Central Avenue prairie, located on the east side of Central Avenue north of Garvey St., in the Silverspring neighbourhood of Saskatoon. The Saskatoon Nature Society had its Interpretation Centre on the southwest corner. This article is based on notes made on 135 days between 15 April 1994 and 25 January 1995. This land is not the fenced Grassland Reserve (closed to the public in 1994) which lies between this prairie (where residential development began in 1995) and the Forestry Farm Park. The prairie described here had a 1.5 km self-guided nature trail which was the general route for each trip.

Some statistics: trips were made on four-six dates per month in April, May and June, and on 15-20 days monthly from July through January. During the butterfly season (15 April-18 October) 35 trips were made in the morning, 57 in the afternoon and four in the evening. There were 12 days on which two trips were made and two with three trips. More than three-quarters of the trips were from 1-1.5 hours long. The earliest and latest field work was 8:28 a.m. and 8:14 p.m. CST — both on 5 August. My assistant (whose only credential was enthusiasm) on most trips was a pup named Journey.

In addition to plants mentioned in the weekly accounts, common flowers of the prairie included: Moss Phlox, Early and White Cinquefoils, Silvery Groundsel, Strawberry, Pale Comandra, Wild Flax, Reflexed Rock-cress, Tufted and Rough Daisy Fleabane, Canada Anemone, Yarrow, Northern Bedstraw, Slender Beardtongue, Skeletonweed, Hairy Golden Aster, Purple Prairie-clover, sages, Saskatoon, Hawthorn, Wolf-willow and Choke Cherry. (Flower names are from *Wildflowers Across The Prairies* by Vance, Jowsey and McLean. 1948.) Among the native grasses were: Plains Rough Fescue, Northern Wheatgrass and Western Porcupine Grass.

This is the sketchiest of summaries. In most cases what is reported for a given week could be repeated several weeks before or after in another year. Usually each plant, bird and butterfly are mentioned only once. Over a three-year period, 130 species of birds and 38 butterflies have been found. On this project the totals were 70 birds and 23 kinds of butterflies. The 1994 butterflies are mentioned in the weekly accounts; other species seen in previous years were: Orange Sulphur; Gray and Bronze Coppers; Western Tailed-, Silvery, Northern, and Greenish Blues; Spring Azure; Silver-bordered Fritillary; a checkerspot; Painted Lady; Eyed Brown; Alberta Arctic; a duskywing, and Common Roadside-

Journey in sora-snipe slough Bernie Gollop

Skipper. (Butterfly names are taken from the *Checklist & English Names of North American Butterflies* published by the North American Butterfly Association. 1995.) There were six species of mammals (plus a coyote previously), one snake and a frog.

9-15 April/1 day in the field: Counted 1,457 Prairie Crocuses along the trail on 15 April. ... The only butterfly was some kind of white flying across the prairie. ... Breeding birds included a year-round resident — Black-billed Mapgie — and two early breeding species — four singing Western Meadowlarks and a Killdeer. ... American Crows, white-headed gulls and Canada Geese flew by — apparently on migration. ... A Richardson's Ground Squirrel expressed her opinion of our presence with loud, short, piercing whistles.

16-22 April/3 days: Migrants included Sandhill Cranes overhead while American Tree Sparrows, resting on their way to the Arctic, sang long and melodiously in some willows. ... An American Robin clucked in alarm and a Northern Harrier hunted over the grass. ... There were a few small brown moths, bees, hornets, a beetle and a spider. ... Pussy Willows were out. ... The ground was bare except for several driftlets. ... At least five depressions were holding water in grass, brush and aspen.

30 April-6 May/2 days: Even though temperatures did not get above 10°C on the 4th, two individuals of our most common white butterflies — Cabbage Whites — were out foraging, as well as a red-tinged, dark brown Red-disked Alpine and a Milbert's Tortoiseshell, the last probably recently emerged from hibernation. (In summer butterflies do not usually fly until the temperature is about 16°C)... Also several minute orange moths. ... Birds feeding on the prairie before going further north included a Swainson's Thrush, White-throated and White-crowned Sparrows. ...

The prairie looking north *Bernie Gollop*

Franklin's Gulls migrated westward. ... Magpies were building a nest.

7-13 May/2: Probably the same alpine, tortoiseshell and white were patrolling their territories. ... Breeding birds that arrived included Clay-coloured, Savannah and Vesper Sparrows, robins, Red-winged Blackbirds, Brown-headed Cowbirds, and a Tree Swallow. The swallow was investigating a metal box. ... A crow called from a bluff. ... Colony of Brewer's Blackbirds had commandeered the buckbrush north of the interpretation centre. ... A Thirteen-lined Ground Squirrel played hide and seek with us, all the time whistling excited, trebled notes. ... First Three-flowered Avens, Early Blue Violets and a little yellow flower. ... Six Prairie Crocuses still in bloom.

14-20 May/1: Yellow Warblers were singing. ... A pair of Mallards flew in wide circles, low over the prairie, looking for a nesting site near two temporary ponds. ... Golden-bean was the dominant flower.

21-27 May/1: First sulphur butterflies. ... Field Chickweed was common and Early Yellow Locoweed had started to bloom. ... The prairie was becoming more colourful and musical: yellow and black American Goldfinches, an orange and black Northern Oriole, House Wren, Eastern Kingbirds and a Least Flycatcher were proclaiming their territories.

11-17 June/1: Missed 19 days — missed the start of the butterfly explosion. ... On 11 June I saw 2 Common Alpines, 11 Clouded Sulphurs, 16 blues (probably more than one species) and 77 Common Ringlets. Ringlets are dull orange butterflies, smaller than whites, that flop around in apparently haphazard directions low over the grass. ... Found a Clay-coloured Sparrow nest with two eggs of its own and one cowbird's (which was not there when I left). ... A Purple Vetch was blooming and Cedar Waxwings had arrived.

18-24 June/2: Heard a Brown Thrasher. ... Butterflies included the

The prairie looking south *Bernie Gollop*

season's first Melissa Blue and Uhler's Arctic.

25 June-1 July/2: Ringlet numbers were declining — only 36 on the 28th. ... Saw two brief, ferocious fights today: blue vs. ringlet and skipper vs. ringlet. Both seemed to end in draws ... Most of our skippers are brown and orange butterflies, about a half-inch long, fly rapidly and change directions frequently — making them difficult to find and to follow. Seeing 25 in one day suggested there were many more. At least some were Garita Skipperlings. ... Twenty kinds of birds this week, including Gray Catbird and Mourning Dove.

2-8 July/3: Heard a Rufous-sided Towhee for the first time; more likely a wandering bird than a prairie breeder. ... A Northern Flicker may be nesting. ... Barn and Bank Swallows flying over. ... Spent a trip photographing flowers and a Great Horned Owl feather with a cam- corder. ... Was startled by a White-tailed Deer exploding from the grass.

9-15 July/4: The season's last ringlets and its first Common Wood-Nymphs. ... Could not catch a crescent. ... Also a Compton Tortoise-shell. ... Heard a Baird's Sparrow. ... Looks like rains have ensured that the small pond near Stop 8 will be the only one to survive the summer.

16-22 July/5: Wood-nymphs jumped to 43. ... A newly hatched Mallard brood skittered into the willows on the Stop 8 slough, which had risen so that it now came across the trail. Blooming meadowsweet occupied about one-third of it. ... A Swainson's Hawk called high above. This bird nested on the prairie before it became so heavily used; probably in the adjacent prairie further north now. ... A stray Pine Siskin flew over as did Purple Martins. ... A Downy Woodpecker worked one of the bluffs. ... Heard a Warbling Vireo. ... Clouded Sulphurs — apparently the only yellow butterfly on the prairie — were increasing — 24 on the 20th and 49 on the 21st. ... Also the first Great Spangled Fritillaries and a small fritillary. ... A Mourning Cloak rushed westward across the prairie. ... On the 22nd two trips: between 9:00 and 10:00 a.m. I counted 41 sulphurs; between 1:00 and 2:00 p.m. 40. Wood-nymphs may be later risers — 14 early and 27 later.

23-29 July/5: Wood-nymphs were the most common butterfly on the prairie — 148 in an hour and a half. ... Counted 240 butterflies in one trip. ... A late Prairie Crocus was blooming along the trail. ... Found two albino Dotted Blazingstars on the east side. ... Had a brief look at a rapid garter snake — 30-35 cm long. ... Also a small Wood Frog. ... Two White-tailed Deer. ... Made an evening trip when sulphurs were going to bed. Counted 25 in 28 minutes prior to 6:50 p.m. but only four in the next 29 minutes. Temperature was still 24°C at the end and sunset was about 9:13.

30 July-5 August/5: Butterflies were everywhere. ... Still 147 wood-nymphs on the 30th. ... Two Purple Martins harassed a harrier. ... One departing White-tailed Jackrabbit. ... First White Admiral this year on the prairie. ... The white blazingstars were barely recognizable. ... A Mallard hen with eight young on the pond — maybe too young to be the same brood as two weeks ago. ... Saw a Tennessee Warbler, probably a southward migrant. ... First signs of mating: two copulating pairs of wood-nymphs and another of blues. ... Also a Western White — first identified this year. ... Another evening visit: four Cabbage Whites in half an hour before 7:40 and none in the half hour after. ... 21 species of birds this week, including a flock of 24 Canada Geese, a Horned Lark and an American Kestrel — four or five species more than on the average summer day.

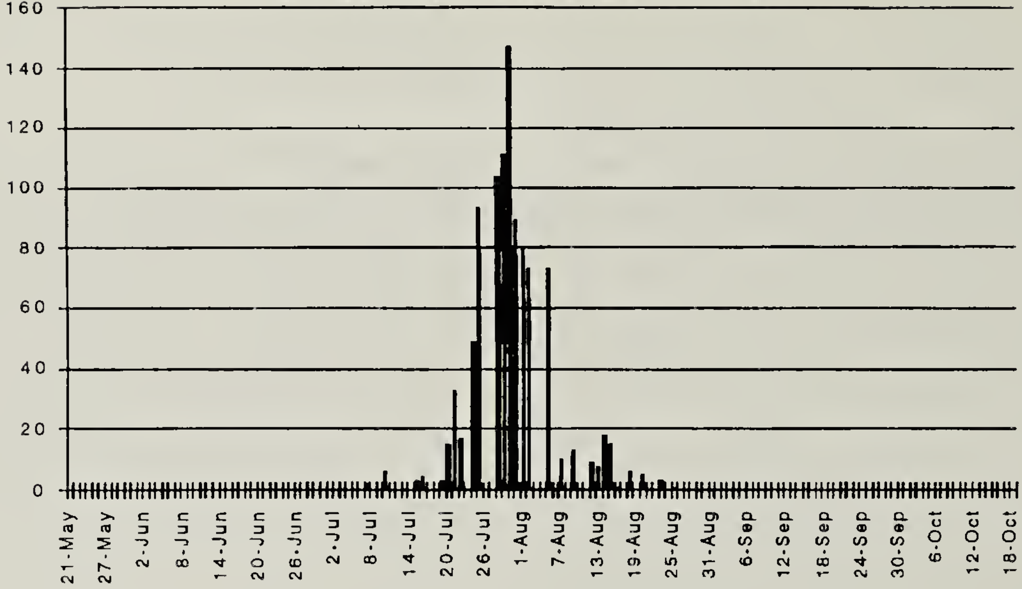
6-12 August/3: Fall bird migration had definitely begun: a Solitary Sandpiper on the slough (which had reached a high level for the third time this summer). ... Identified the first Common Branded-Skipper and added Red Admiral and Black-capped Chickadee to this year's prairie list.

13-19 August/5: Single Aphrodite, Mormon and Variegated Fritillaries identified. Probably among unidentified butterflies seen earlier. ... A wandering Loggerhead Shrike. ... A Red-tailed and a Swainson's Hawk disputed the air space high above. ... Two-thirds of the large Canada thistle patch between Stops 6 and 7 had gone to seed. ... Eleven species of butterflies this week, three or four more than on an average day in July and August.

20-26 August/4: First and only Little Wood-Nymph. This record was a 150 km northward extension of its range in Saskatchewan. ... Last Common Wood-Nymphs, ending a six-week season for this single-brooded species (Chart 1). ... The 26th was overcast, rain until start of 56-minute hike; 12°C. No butterflies — too dark, too cold, too wet.

27 August-2 September/5: Two Prairie Crocuses in bloom at the edge of the trail. ... Migrants to the prairie were Merlin, Hairy Woodpecker, Common Yellowthroat and three Blue Jays. ... A flock of 80 White-fronted Geese conversed as they headed south from their Arctic breeding grounds. ... A migrant Sora showed up at the pond which had a thin coat of green algae on it. ...

Chart 1. Wood Nymph numbers on the Central Avenue Prairie — 1994. One Brood.



Flock of eight Gray Partridge. ... A garter snake — 12-15 cm long — one day and another — 15-18 cm — the next. ... Up to 106 whites (probably all Cabbage).

3-9 September/4: On the 5th, many sulphurs were flying south. So I sat on a hillside facing west between Stops 2 & 3 to check a 200 m width of prairie with binoculars. In 40 minutes from 10:32 a.m., 392 sulphurs flew south (nine went north) which works out to almost 600 sulphurs per hour across that narrow band. How wide was the flight, how many hours did it last, how many days might it continue, and why was it made? The highest count walking the trail was 163 this week. ... The next day 91 sulphurs flew south in 30 minutes after 3:16 p.m., the equivalent of 180/h. ... On the 8th most sulphurs & whites were headed south all across prairie. ... Two days this week a Common Checkered-Skipper — gray-brown with white spots — patrolled the parking lot. ... Found a Clouded Sulphur in a spider web, a foot above ground between two grass stems. Helped it escape on its own. ... Less than 5% of the Canada Thistle patch is in bloom. ... Saw a Thirteen-lined Ground Squirrel. ... Migrant birds included a Northern Waterthrush at the pond and two Lincoln's Sparrows.

10-16 September/5: The Sora apparently ended its 13-day vacation on the slough. ... As if waiting for it to leave, four Common Snipe occupied the pond and a fifth flushed from the nearby prairie. ... Other migrants were an Orange-crowned Warbler and a White-crowned Sparrow. ... Found the Checkered Skipper on the parking lot twice this week, once on a common dandelion, instead of the ground. ... Unusual butterflies were Western White and Melissa Blue. ... Counted southbound sulphurs for 10 minutes on the 12th and 13th, getting the equivalent of 115 and 138 butterflies per hour. ... Pond still at two-thirds of peak area. ... Among the few flowers in bloom along the trail were: one each of Dotted Blazingstar, Goats-beard, Many-flowered Aster, gaillardia, Flodman's Thistle and Owl's-clover; 5 goldenrods and harebells; 15 dandelions, more Canada Thistles and several hundred sow-thistles.

17-23 September/5: Aromatic smoke noticeable from northern forest fires. ... The Checkered Skipper was found some days, not others. ... Another Mourning Cloak westward across the prairie, disappearing beyond binocular range. ... South-bound sulphurs decreased through the week, falling from 144/hr to 66/hr. ... The five snipe were still feeding at the slough. ... Migrants included Great Blue Heron, Yellow-rumped and Palm Warblers. ... Also three Sandhill Cranes — calling from the clouds — and two American Tree Sparrows. It has been five months since these two species were here on their way north. ... About half the leaves were off the trembling aspens.

24-30 September/4: The Checkered Skipper apparently ended his 21 days of parking lot duty. ... Up to three snipe continued to use pond and prairie. ... Southbound sulphurs were petering out: down to 18/hour. ... Migrant birds continued to drop in — Dark-eyed Juncos, Rusty Blackbirds and a Le Conte's Sparrow. ... A few grasshoppers & crickets.

1-7 October/5: The trail was made up of about 90% long, flattened grass, 9% shorter grasses and mosses, and 1% rock and bare earth. ... On the 1st, I noted two bumblebees, a honeybee, two flies, two flying beetles, a spider and the season's last dragonfly — small and brown. ... Also a Savannah Sparrow, American Goldfinch and Pine Siskin. ... Saw 10 Clouded Sulphurs on the 5th as well as a comma and a white. ... Flowers that might provide nectar for them along the trail were scarce: 1 Many-flowered Aster, 1 Harebell, 1 White Sweet-clover, 2 rape, 12+ sow-thistles, 2 Flodman's Thistles, 10± nodding-thistles, 10+ dandelions and some alfalfa were noted. ... Pond was down to a quarter of its greatest area. ... Most leaves off buckbrush (or snowberry) and aspen. ... One large black-&-white-winged grasshopper and four smaller ones. ... A flock of 20± small midges low over a small bare rock — maybe attracted by its heat.

8-14 October/5: Hovering flock of 40± midges over buckbrush. ... Seventeen very tame Rusty Blackbirds feeding as we walked through what was left of the slough. ... Spider strands were blowing in the wind from pond vegetation. ... Seven sulphurs on the 9th; in the last few days most of them have been in the Central Ave. ditch where alfalfa is flowering. ... Also a lady bug, yellow jacket, house-fly type, five small grasshoppers and a bright brown spider, half-inch across, including legs. ... Flushed five Gray Partridge. ... The snipe terminated their stay after 29 days; the last two were at the pond — no surface water — on the 13th. ... Tragedy: next day a pile of about 75 fresh snipe feathers in pond mud; no sign of a struggle; probably an avian predator. ... Practically all leaves were off the aspens. ... A dead shrew on the trail; no sign of blood; body: 40± mm; tail: 32 mm. Found one in the same condition 18 September 1993.

15-21 October/3: End of the butterfly season: one sulphur twice or two sulphurs on the 18th (final date in 1993 was the 23rd). Producing two broods, they enhanced the prairie for five months — more abundantly than any other butterfly (Chart 2). ... A Pine Grosbeak, arriving for the winter, flew over, giving single, musical notes. ... Walked through the pond bottom. Thousands of small holes all across it, made by snipe as they probed for food. ... Flushed a deer. ... Seven dandelions blooming around parking lot.

22-28 October/4: A swirl of 30-40 midges on the 23rd and another of 25± on the 27th. ... The brightest feature on the prairie were red rose

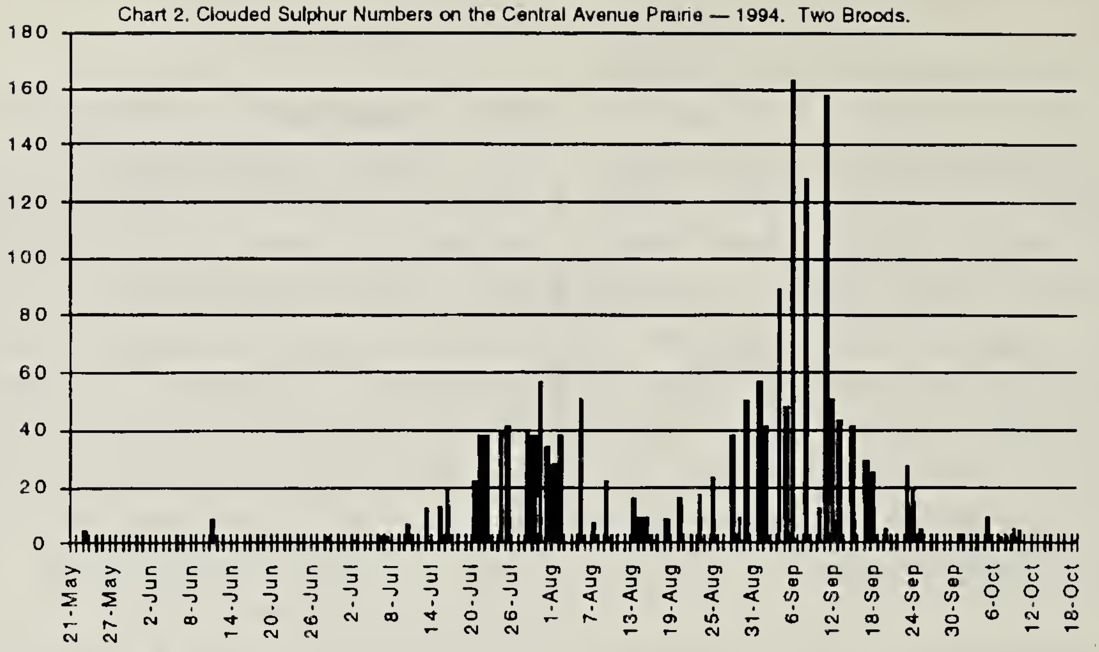


Chart 2. Clouded Sulphur Numbers on the Central Avenue Prairie — 1994. Two Broods.

hips; not many. ... A few juncos. ... On the 28th: -1°C; first frost in shade. ... Small white spider; body 2-3 mm. ... A deer.

29 October-4 November/3: First snow on the 2nd — 2-5 cm on the ground. ... Many rabbit and several deer tracks. ... Mouse trails across the path at 26 places. ... Tops of many rocks bare. ... Nine Gray Partridge. ... A late American Tree Sparrow.

5-30 November/11: Large broken wasp nest in tree. ... On the 10th, 760± Canada Geese in the stubble field southwest of the prairie around 3:00 p.m. ... Ground one-third snow-covered on the 10th, 99% snow-free on the 23rd but with 5 cm of snow on the 28th. ... Three White-tailed Deer flying from an aspen grove. ... A siren started coyotes & wolves howling in the Forestry Farm Zoo.

1-31 December/17: On the 1st, 600± Canadas in the same field. The next day flocks of 40 and 150 headed south over town and none were seen in the vicinity after that. ... 9 December, first ski tracks on the prairie. ... 12th: three Common Ravens flew vociferously over the Forestry Farm. ... On the 15th, a Northern Goshawk scrutinized us disapprovingly from a fence post. ... Long, short and multiple arcs sculptured in the snow by grass tips blowing back and forth. ... Mouse, hare and partridge tracks close enough to fit into one photo frame. ... Hoarfrost heavy on grass and weeds. Pretty in the sun. ... As the snow melted, small, interestingly shaped patches evolved. ... Also translucent ice-bridges reached from one snow islet to another.

1-25 January/15: On the 4th: -20°C with 10± cm of snow on ground. ... Much hoarfrost. ... Journey expended some energy on a jackrabbit — twice. ... 10th: 330± Bohemian Waxwings in a bluff. ... 13th: A porcupine in the grass and weeds south of the parking lot. Again on the 18th. ... 16th: 10-15 cm of new snow yesterday and today. ... Eight partridge. ... A quick Red Fox. ... 12th: 1st snowmobile tracks. ... 24th: wolves and coyotes carolling.

BIRDS

INCOMPLETE ALBINO GREAT GRAY OWL IN IDAHO

MICHAEL B. WHITFIELD, P.O. Box 136, Driggs, ID. 83422, MONYA E. MAJ, P.O. Box 263, Tetonia, ID. 83452 and JILL KELLEY, Chippewa National Forest, Walker, MN. 56484

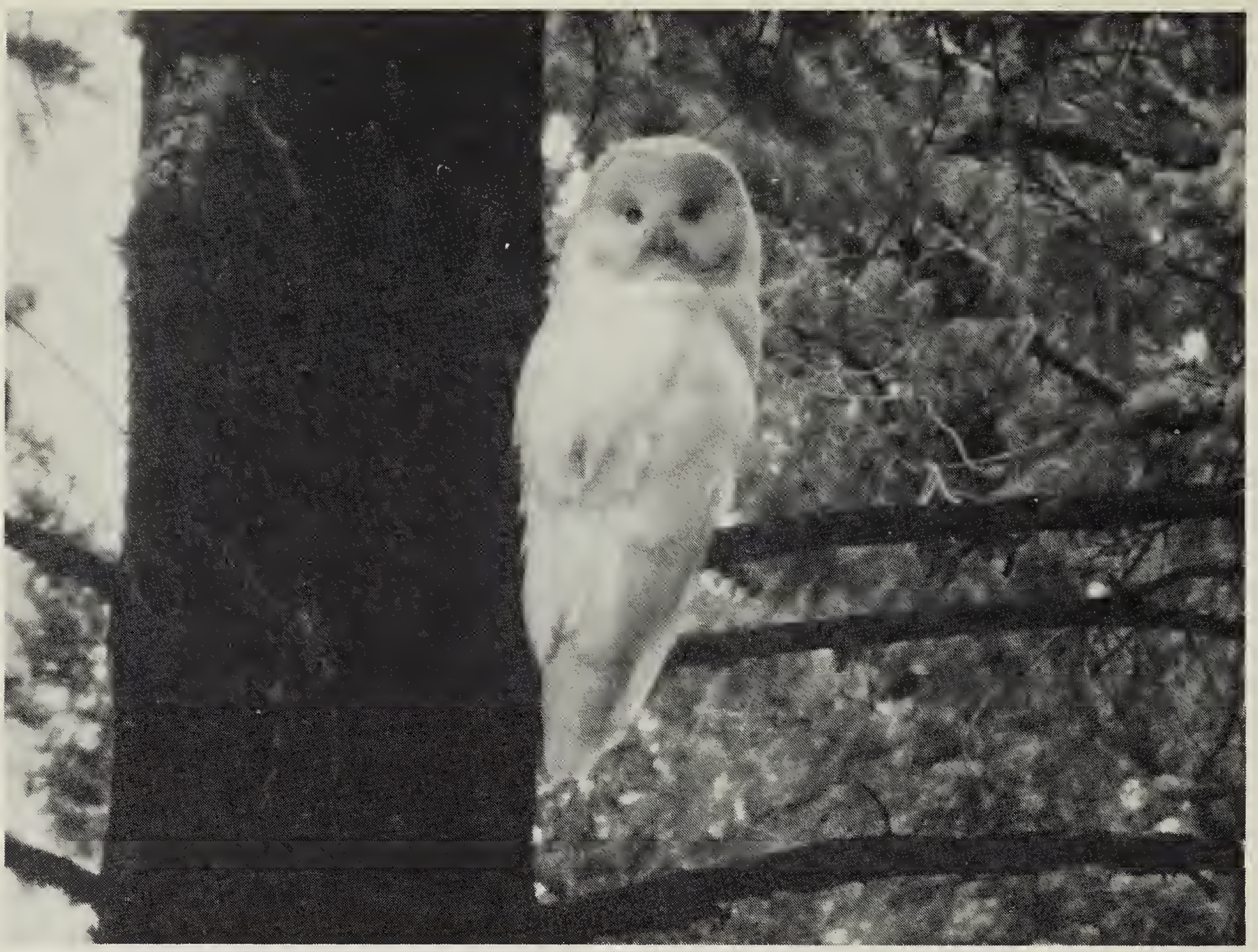
Occurrence of the Great Gray Owl is well documented in southeastern Idaho.[2] Although recent information suggests concern over reduced observations of the Great Gray Owl in the area,[4] U.S. Forest Service biologists and local researchers have documented many local nests.[9] In this note we present records of an adult Great Gray Owl with almost completely white plumage that nested in southeastern Idaho over a three-year period and its offspring in two of three years.

Between 1990 and 1992 several observations of an adult white Great Gray Owl were recorded in southeastern Idaho. Summer observations in 1992 were in nesting habitat within 0.5 km of 1990 observations at a nest site. Based upon the consistent description and locations of these observations, they are all thought to represent the same adult owl.

On 3 May 1990 an employee of Harriman State Park in Island Park, Idaho reported seeing a Snowy Owl to the local Targhee National Forest Service District. Island Park District biologist J. Kelly confirmed that the owl was a Great Gray Owl, and documented the white bird on videotape during a 20 minute observation as the bird perched in a tree near the nest — a broken topped Douglas fir approximately 2 m high. This white owl was observed with a normally coloured adult Great Gray Owl, which delivered a pocket gopher sized prey item to one of two gray owlets seen in the nest area. The white adult Great Gray Owl and a fledged juvenile were seen in early July near an active Bald Eagle nest approximately 1.5 km south of the Great Gray nest. The following winter, two Forest Service employees reported seeing a large white owl near State Highway 20 approximately 14.5 km from the nest area. The nest area was searched in spring 1991, but no owls were located. The original nest tree had fallen.

On 13 and 21 June 1992, an adult white Great Gray Owl and one fledged owlet of normal colour were seen approximately 0.5 km from the original nest area. The owlet was not examined in hand, but appeared to be the normal gray plumage. Only the one adult was observed and a nest tree was not located. We believe that size and behaviour suggest that the white adult was a male.[1] In spring 1993, a normally coloured pair of Great Gray Owls nested atop a 2 m high Douglas fir snag near the original nest tree. The white owl was not observed during several 1993 and 1994 searches of the areas where it was earlier located.

Figure 1 is a photograph of the white owl taken in June 1992 and illustrates the extent of albinism. Although the bird was never inspected



Incomplete albino Great Gray Owl *Michael Whitfield*

in hand, its plumage appeared to be almost totally white. The bird had no barring, lacked concentric circles around the eyes, and was entirely white except for several dark secondary feathers observed on the right wing. Secondary wing and downy feathers collected at the site were entirely white. The eyes were of normal colour with yellow irises which suggest that the bird should be considered an incomplete albino.[3,6]

We are aware of four published records of incomplete or partial albinism in Great Gray Owls.[5,6,7,8] The first three individual reports were of owls observed in Manitoba, Canada. R. Nero (pers. comm.), who has handled over 100 Great Gray Owl skins, and T. Swen (pers. comm.), who maintains records of albinism in birds, believe that these records represent the extent of documented albinism in Great Gray Owls in North America. The latest report is of a partial albino in Finland.[8]

This is the first record of an incomplete albino Great Gray Owl documented in Idaho and the Northern Rockies region. The documentation (video tape, photographs, and narrative descriptions) of the observed white Great Gray Owl suggest that they were all of the same bird over three breeding seasons. This is a unique record of long-term occupation of a breeding territory by an albino owl. This note also provides a record of an adult albino Great Gray Owl producing three normally plumaged gray owlets in the two of three breeding seasons that the owls were observed.

Observation of this bird stimulated examination of slides taken of light coloured Great Gray Owls in 1980 by M. Maj on the Targhee National Forest approximately 112 km from the bird reported here. Close examination of these slides suggests that these Great Gray Owls were imperfect albinos. Their plumage was far lighter than expected, but not the striking white of the owl we reported here.

We acknowledge helpful comments on this report from Dr. Robert W. Nero.

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* * *

In the succession, pioneer species are the sprinters, old-forest species the long-distance runners. The violent changes and a clearing of space bring all the species briefly to the same starting line. The sprinters dash ahead, but the prolonged race goes to the marathoners. Together the two classes of specialists create a complex mosaic of vegetation types across the forest which, by regular tree falls and landslides, is forever changing. If square kilometers of space are mapped over decades of time, the mosaic turns into a riotous kaleidoscope whose patterns come and go and come again. A new marathon is always beginning somewhere in the forest. The percentages of successional vegetation types are consequently more or less in a steady state, from earliest pioneer species through various mixes of pioneer and deep-forest trees to stands of the most mature physiognomy. *Wilson, E.O. 1992. The diversity of life. W.W. Norton and Company, New York. 424 pp.*

EXPERIMENTAL NESTBOXES FOR BLUEBIRDS: AN UPDATE

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I started experimenting with Mountain Bluebird nestbox designs in 1987. The number of kinds grew to 10 by 1990, and to 13 by 1994. Some are standard nestboxes with varying dimensions; others are test boxes of several designs with two entrances. I now have 72 boxes of 13 kinds. Previously I showed that bluebirds prefer the test boxes and Tree Swallows the standard boxes.

This article gives the results up to 1995 for the two most successful kinds of test boxes. When these boxes are paired with standard boxes with predator guards, bluebirds have favoured the test boxes by more than a factor of four. Because of serious raccoon predation in 1989 and 1990, my objectives were expanded to develop a box that was: raccoon-resistant without the use of special mounting poles or other predator guards; similar in size and weight to standard nestboxes for easy mounting on fence posts; and relatively easy to build.

The two test box types (see Fig. 1) have double entrances. Plan A uses sloping passages to prevent raccoons reaching into the nest. The entrances are slots 1.25" X 2.5". Plan B uses a shelf below the entrance holes for predator protection. The circular entrances are 1.5" in diameter. Earlier versions of this type used slot entrances and external guards similar to Plan A. The change to round holes without external guards simplified the plan while maintaining adequate predator protection. Both types have a floor size 5.5" X 5.0". Depth from the top of the baffle to the floor is about 7".

My standard boxes have a 1.5" diameter circular entrance. Each has a raccoon guard, an interior baffle below the entrance. Some also have an exterior guard, a small block of wood with a 1.75" hole, thickening the entrance wall. The floor size is about 5" X 5"; depths range from 6-7".

Boxes are mounted on fence posts bordering grazed pasture with some scattered trees — good bluebird habitat. At each site, a standard box and a test box are mounted about 10 yds apart, the distance between sites being about 250 yds. To avoid biasing the data, each type has boxes at varying distances from trees, ranging from 50 yds to 0.5 miles. Boxes are monitored regularly to determine nesting species and nesting success.

Table 1 gives the occupancy by species for the two test boxes and the adjoining standard boxes. An occupied box is defined here as one in which a nest is built and at least one egg is laid. The “Other/Empty” category includes boxes used by other species and boxes used by bluebirds or swallows where the nesting did not advance to the egg-laying stage. Note that the sum of the other three categories can exceed the number of box-years. This is because bluebirds and swallows sometimes nest in the same box in one year, usually with the swallows following the bluebirds.

The table shows the strong preferences. Of the 109 boxes occupied by

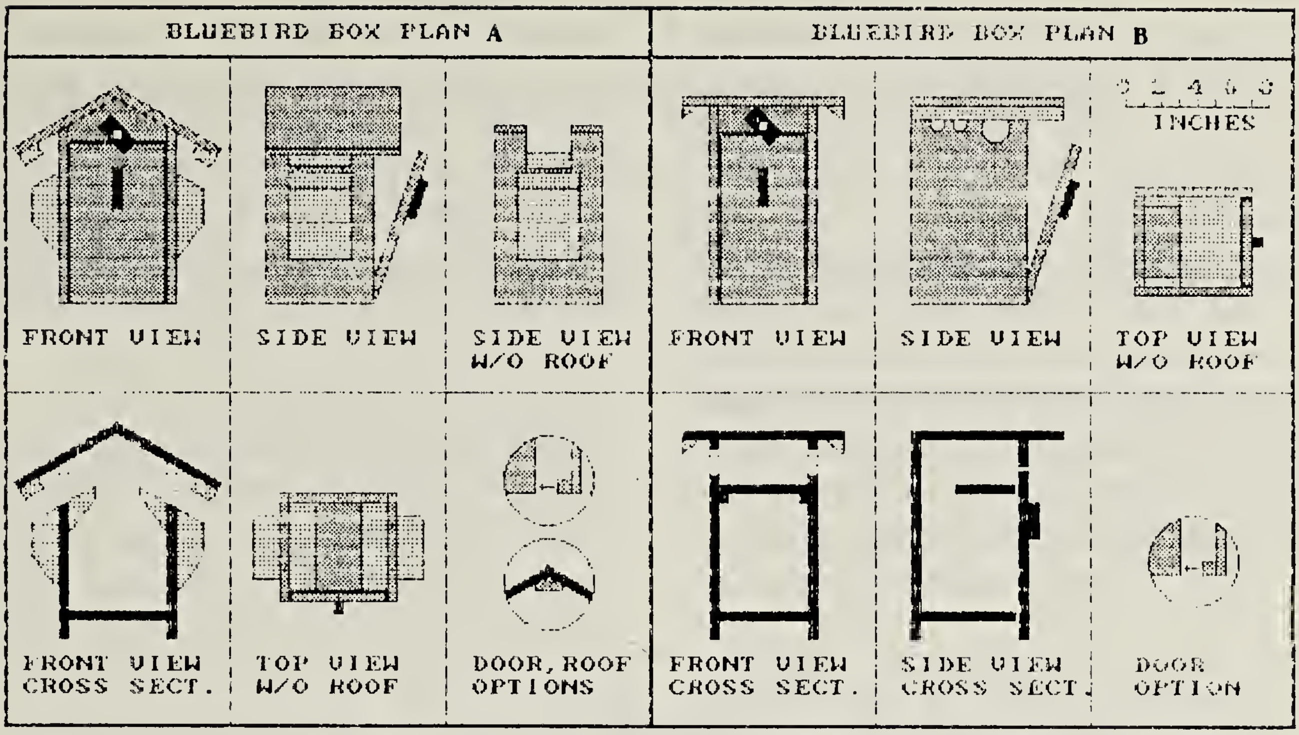

Figure 1. Experimental double-entrance bluebird nestboxes.

bluebirds at the Plan A sites, 90 were test boxes and 19 were standard boxes. Of the 58 boxes occupied by bluebirds at the Plan B sites, 47 were test boxes and 11 were standard boxes. At both types of site, swallows chose the standard boxes by an even wider margin. Some of the test box data came from earlier versions of the latest plans.

An interesting aspect of the swallow data is that there are two factors involved in the occupancy rate. In addition to the swallows' preference for the standard boxes, there are more standard boxes available when the swallows nest. This is because bluebirds usually choose the test boxes, leaving the standard boxes for the later-nesting swallows.

Discussion Swallows spend considerable time looking out their entrance hole. With two entrances, they cannot guard both at once, hence they may dislike the double-entrance boxes. Bluebirds may prefer the test boxes because there is less competition with swallows. This is probably a minor point because bluebirds usually nest first. Bluebirds also may prefer a more open box. Note that they occasionally nest on a ledge on the interior or exterior of a building. In addition, bluebirds may prefer an entrance which is partly concealed by an overhanging roof, or one where the bird enters at an upward angle. Bluebirds occasionally fly upwards to reach a nest. For example, they have been known to nest in such places as the outlet of a grain

Table 1. EXPERIMENTAL BOXES AND ADJOINING STANDARD BOXES OCCUPIED BY BLUEBIRDS AND SWALLOWS.

Type of Box	Box-years	Bluebirds	Swallows	Other/Empty
Plan A Experimental Boxes	119	90	11	19
Adjoining Standard Boxes	119	19	100	5
Plan B Experimental Boxes	119	47	9	18
Adjoining Standard Boxes	119	11	49	14

auger in a farm yard. The test boxes are easy to enter and safe to inspect. A bird is not required to squeeze through a long, tight passage before it can inspect the box, as one type of predator guard requires. They may view the boxes as being more predator-resistant. The nest cannot be seen by a predator unless it actually enters the box. However, this is also true for most of the standard boxes used in this experiment, since they are equipped with predator guards.

Acknowledgements I thank Bill Anaka of Canora, SK for building and testing boxes based on these designs. He supplied much of the data in Table 1. For their interest in this project, I also thank Roxanne Brown of Assiniboia, SK, Don Stiles of Calgary, AB, and Myrna Pearman of Ellis Bird Farm, Lacombe, AB.

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I was intrigued by the circumstance that social insects, the group on which I have spent most of my life, are among the most abundant of all organisms. And among the social insects, the dominant subgroup is the ants. They range 20,000 or more species strong from the Arctic Circle to the tip of South America. In the Amazon rain forest they compose more than 10 percent of the biomass of all animals. This means that if you were to collect, dry out, and weigh every animal in a piece of forest, from monkeys and birds down to mites and roundworms, at least 10 percent would consist of these insects alone. Ants make up almost half of the insect biomass overall and 70 percent of the individual insects found in the treetops. They are only slightly less abundant in grasslands, deserts, and temperate forests throughout the rest of the world. *Wilson, E.O. 1992. The diversity of life. W.W. Norton and Company, New York. 424 pp.*

PREY CACHING BY NON-BREEDING NORTHERN HAWK OWLS IN ALBERTA

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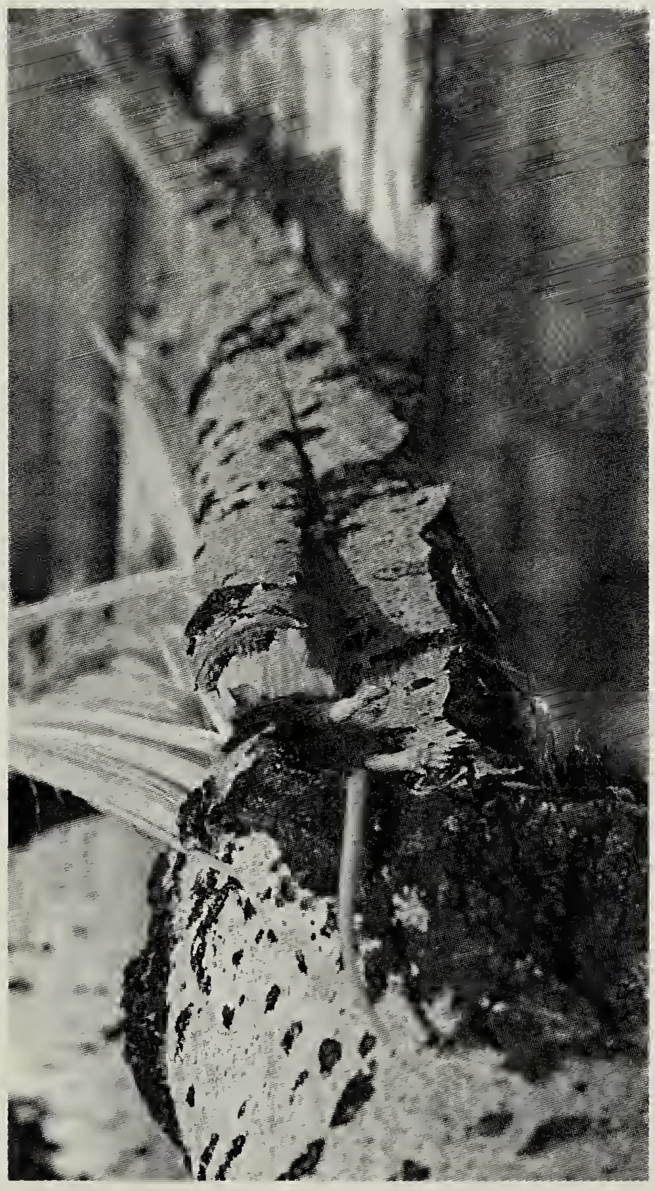
Caching prey for later consumption has been reported for a number of wild owl species, although most accounts are of birds breeding or likely to be breeding: Short-eared Owl during May in Idaho[9]; breeding Northern Hawk Owls in Alaska[8]; non-breeding and breeding Northern Hawk Owls in Minnesota and throughout Manitoba[3]; a Northern Hawk Owl during the breeding season in Quebec[6]; Boreal Owls during the breeding season[5]; and an Eastern Screech Owl during April in Ontario.[7] Collins[2] reviewed caching by captive owls: pre-breeding Northern Hawk Owls; breeding Great Horned Owls; and non-breeding Barn Owls.



Cached Northern Hawk Owl prey

Doug Collister

Reports of caching by wild owls outside the breeding season are rare. The following documentation of caching by wild non-breeding Northern Hawk Owls during the winter in Alberta provides additional information on this behaviour.

On 26 January 1990 a Northern Hawk Owl was found perched, northwest of Calgary (51°39' N, 114°34' W), on top of a tree in a small grove of aspens next to a stubble field. For over an hour I tried to entice the bird to a free-ranging dark-coloured laboratory mouse in the stubble but elicited little response and did not effect a capture. As a last resort I moved into the aspen grove and immediately the owl came in and actually managed to steal the mouse and elude capture. I set up again and offered another mouse. The owl appeared to become agitated and cached the first mouse behind a piece of bark on a windfallen poplar. It then came in to the second mouse and was captured. Upon release no additional live mice were offered and the owl showed no interest in a frozen mouse carcass dragged with thread. On several previous occasions hawk owls have taken dead mice offered to them in this way by the author. Similarly, Duncan and Duncan[3] found that only rarely did hawk owls not take small rodent carcasses when offered.

On 8 January 1994 a Northern Hawk Owl was found perched, southwest of Calgary (50°50' N, 114°29' W), in an open aspen grove some 300 m distant on a south-facing hillside. It was lured in after several minutes to a free-ranging dark-coloured laboratory mouse and was netted for banding. After release the bird perched on a power pole overhead. Upon being offered a mouse on a fencepost the owl swooped down and took the prey item back to the power pole where the mouse was beheaded. The owl allowed the head to drop to the ground. When a second mouse was offered on the fencepost the owl flew to a nearby spruce tree within which it stashed the carcass of the first mouse. It then returned to the power pole and immediately swooped down to take the second mouse. This second mouse was taken to another spruce tree approximately 150 m distant and stashed. The owl then returned to the power pole and glowered expectantly at the "magic" fencepost. No additional live mice were provided and the owl did not respond to a frozen mouse carcass dragged with thread or an artificial lure.

Caching of prey is thought to be an adaptive advantage for any species dependent on a food source that fluctuates.[2] The availability of small rodents, that many owls depend on, is known to fluctuate yearly, seasonally, daily, and due to weather. Caching by non-breeding Northern Hawk Owls could be an adaptation to deal with daily fluctuations in prey abundance and the periodic occurrence of adverse weather. The Northern Hawk Owl is a resident of the northern boreal forest and is subject to extreme weather conditions year-round. Although thawing frozen cached prey is an energy drain on an owl, it may still be advantageous to store prey, especially during extreme cold.[1] Northern owls, like the Northern Hawk Owl, may exhibit more highly developed caching behaviour due to the capacity of prey to be preserved for long periods in the cold northern climate.[4]

Acknowledgements I thank J. Podlubny and D. Wicklum for field assistance. P. & J. Duncan, A.J. Erskine, R.W. Nero and two anonymous reviewers provided helpful comments on an earlier draft of this note.

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NOTES ON A WINTERING NORTHERN HAWK OWL IN MANITOBA

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The Northern Hawk Owl's usual habitat in Manitoba is in the Boreal Forest where it is considered "extremely rare," but it has even nested in the Aspen Parkland where it occurs mainly as an occasional winter visitant; Patsy Duncan listed it as a "rare irregular transient" in southern Manitoba.[3] In winter 1991-92, a large number of Great Gray Owls and Northern Hawk Owls were seen in Manitoba and elsewhere in Canada.[7] In southeastern Manitoba, Herb Copland and I saw 26 Great Gray and 23 Northern Hawk Owls in one day, 22 February; we joined a group effort (13 persons in seven cars) covering a larger area on 7 March, finding 23 Great Gray and 38 Northern Hawk Owls.[4] By comparison, in winter 1993-94 both species were scarce. That winter was, as noted by Grieef, "one of the coldest that we have had in a number of years."[6] Copland and I drove more than 1,870 miles (3,000 km) on five outings between 11 December and 20 March, finding not one Great Gray and only two Northern Hawk Owls, both of which we banded, at Fort Alexander Indian Reserve (Sagkeeng First Nation) and near Manigotagan. Four other Northern Hawk Owls were observed at Pinawa, Rivers, Vassar and Winnipeg.[5,6,11]

The Charleswood Northern Hawk Owl

Jamie Ruggles

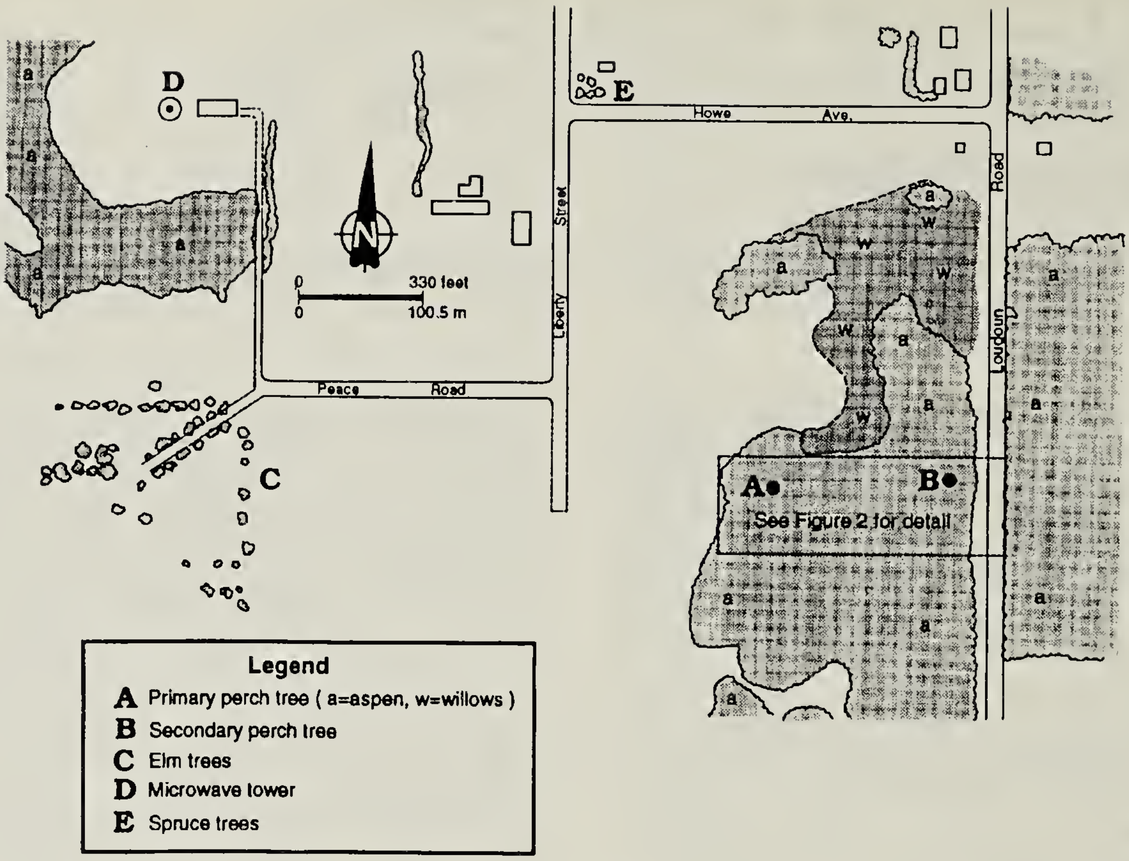

Figure 1. Winter territory of a Northern Hawk Owl in Winnipeg, MB, from 19 December 1993-18 March 1994 (from aerial photo and field notes).

Northern Hawk Owls appearing in Winnipeg in the past have not usually stayed for more than a few days, but this one was present from December 1993 to March 1994. It provided an opportunity to obtain some information on Northern Hawk Owl winter habits, a little known aspect of this species. This bird stayed in a portion of the suburb of Charleswood. The area lies southwest of extensive residential and commercially developed zones, but is relatively undeveloped. It is on the northern edge of continuous farmland, with scattered residences, cultivated fields, abandoned fields and some extensive aspen-oak woods. (In November 1991, two Northern Hawk Owls were recorded 2 miles (3.5 km) east and 4.7 miles (6 km) southeast of this site.) The area occupied by the owl is shown in Figure 1. A Trembling Aspen (*Populus tremuloides*) woods (right side of Fig. 1), where the owl spent most of its time, contained several mature aspens [9-11 cm (3.5-4.3 inches) diameter at breast height], a few Bur Oaks (*Quercus macrocarpa*) and ash, and some old dead willow clumps. The owl often perched on trees close to an adjacent well-travelled road (Loudoun) just as did a Northern Hawk Owl that wintered near Prince Albert, Saskatchewan in 1991-92. That bird, which spent the entire winter "within half a kilometre" of the Barton residence, had "three or four favourite lookout trees very close to the road."[1] Our bird, so far as I'm aware, stayed within the 50.1 ha (123.8 acres) shown in Figure 1.

One particular tree, an aspen about 13.7 m (45 feet) tall, provided a perch from which the owl could see in all directions over its winter territory (Figure 1-A). It often sat on or near the top of this tree, especially early and late in the day. Sometimes it sat lower down, as much as 1.2-1.5 m (4-5 feet) below the top; from a distance one had to look hard to see if it was close to the trunk. Perched on top, however, it was conspicuous. I called this the primary perch tree (PPT). A second tree, an aspen about 9.1 m (30 feet) tall and to the east of the PPT, was used as an alternate or secondary perch tree (SPT) (Figure 1-B). The owl also hunted from trees at the north end of the willows, from hydro poles along the roads (especially along Peace Road), and from the elms to the west (Figure 1-C). One or two elms, in particular, were often used. Two sites seemed to be preferred hunting spots, the grassy fields near the elms and the weedy lowland at the north end of the aspen woods. Heavy grass and, as I discovered after the snow began to disappear, a variety of junk lying in the willow-sedge area just off Loudoun Road, sheltered an abundance of voles. Most hunting seemed to take place in late afternoon and evening and early in the morning. The few times I saw it capture prey, it looked as if it was finding prey visually. Voous notes: "Hunting mostly by day, the Northern Hawk Owl looks around for prey from an exposed treetop or other commanding post. ... On other occasions it dashes with astonishing speed low through the forest and over and around shrubs like a Sparrowhawk, soars like a falcon or hovers like a Kestrel watching for moving prey. In all these respects it behaves more like a diurnal raptor than an owl."[13]

Jan E. Collins was the first to see this bird, on 19 December 1993. A resident of Charleswood, Collins trains his dog in this area. Since he had been going there at least twice weekly from the third week in November onwards, it seems likely that the first time he saw the bird was about the time it arrived in that particular area. In the afternoon of 19 December, Collins noticed it sitting on a hydro pole near the elm trees where he regularly parks his vehicle (west end of Peace Road). Shortly after pointing it out to his son, Darin Kozak, the owl flew over the adjacent open field, hovered, plunged into the snow, then returned to the pole to eat its prey. Collins saw it again on 24 December, and the next day reported it to a member of the Manitoba Wildlife Branch staff.

I heard about the bird on 6 January 1994 and that evening found it in the same vicinity. On 8 January, Patsy and Jim Duncan and I attempted to capture the bird for banding, but it showed little interest in our lures. In fact, the owl sat on the same hydro pole where Collins had first seen it and ignored our live mouse running below it on the road. On three later days, Bob Berger and I attempted in vain to lure the owl to a net or trap. A live gerbil, loose on the snow as the owl perched about 20 feet away one cold day, held its attention for several minutes. Once it looked like it might come down to my net, but it flew down to the ground behind me where it seized a vole. The Duncans had similar results with Northern Hawk Owls in January 1987 in northern Minnesota.[8]

Judging by the owl's lack of response to our live bait, it was well fed, doubtless the result of a local high vole population. And presumably this was part of the reason the owl spent the winter here within a relatively small area. Throughout winter, small mammal burrow openings in the snow were numerous. After the snow cover disappeared, vole eat-outs could be seen in the heavy grass where the owl had often hunted. As the snow melted away, a few dead voles were found on snowmobile tracks, apparently crushed by the vehicles passing over them.

Through January, despite severe low temperatures and strong winds, the owl could often be found perched in the open on top of hydro poles or trees. Because this area is only a few minutes from my home, over the next two months I was able to show the owl to more than two dozen people, including some avid photographers. The Northern Hawk Owl was also viewed by a number of birders. As is characteristic of the species, this bird was bold, accepting people and dogs unreservedly. Often it allowed us to approach to within 6 m (20 feet) of its perch. On two occasions when it was perched on top of a tree, it refused to budge even when I shook the tree. It simply looked down at me as if wondering what I was up to. Others have had similar experiences with this bold species. Bent notes: "It has repeatedly shown no concern when closely approached and has even been captured by human hands."[2] During a recent influx of Northern Hawk Owls in Saskatchewan, according to James, "one person was even able to pet an owl!"[7] Ray Tuokko (pers. comm. 1994) told me how one winter at Lac du Bonnet he climbed up a tree to see how close he could get to a Northern Hawk Owl sitting on the top twig. He nearly touched it before it flew.

Twice I saw the Northern Hawk Owl being harassed by a Hairy Woodpecker, and other observers told me they'd seen this happen a few times. The woodpecker's brief swooping flights towards the owl — usually perched at the top of a tree — seemed to have no effect on the owl. Three Black-capped Chickadees, apparently local residents, for I saw them on several days, frequently made passes at the owl. Once, a small flock of Common Redpolls fluttered excitedly near the owl.

Initially, it was unclear how long the Northern Hawk Owl would remain, and I had only moderate interest in it. About 9:00 a.m. on 5 February, I saw it cast a pellet. After the owl moved away, I retrieved the pellet and, by digging in the snow, found a second one. I became intrigued. Thereafter, I looked for pellets in the snow wherever I saw the bird perched, as well as under hydro poles and isolated trees in the area. In the end, I visited the area on about 30 days, from 8 January to the end of March. At first it didn't occur to me to take notes, but from 1 February onwards, when I began making frequent visits, I carried a notebook and pencil, recording a few observations.

Often, the owl could be seen out in the open on some conspicuous perch, but there were days when we couldn't find it. One bright, cold January day, the owl moved from a treetop perch on the edge of the woods back into the woods. We found it about 18.2 m (20 yards) inside the woods and about 4.3 m (14 feet) up near the trunk of an aspen. If we hadn't seen it fly in that direction, it could easily have been overlooked. Conspicuous when sitting up high in the open, it blended in surprisingly well when perched on a branch inside the shelter of the woods. I attempted to follow it about on a few occasions, though snow depth and low temperatures (and my age!) made this difficult. One day I was excited to see it fly up onto an old American Robin nest on the side of an aspen trunk. It sat in the nest, playing with nesting material, moss in this case, some of which fell onto the snow. I thought at the time that perhaps it had a mouse cached there, but after five or six minutes in the nest, the owl moved away. Owl whitewash on the trunk of the tree and the edge of the nest, however, showed that the bird had been there before. A month and a half later, I found whitewash, presumably from the owl, on yet another robin nest in another part of the woods. I surmised that these were roost-sites or resting places, the flat surface of the old nests possibly being attractive to the owl. In this woods, as I discovered, there were practically no other features that afforded the bird a platform, something reminiscent of the hollow at the top of broken tree trunks such as Northern Hawk Owls often use as a nest site.[2,9,12]

I had followed the owl a few times, trying to see where it went to roost for the night. I expected it to go into some tree cavity late in the evening. At -30°C, and that winter there were many nights at or below this temperature, this seemed logical. I spent a few cold evenings standing around in the woods watching the owl on its primary perch tree, waiting to see where it would go. My evening vigils yielding puzzling results with the bird suddenly dropping down and away and disappearing in the woods, and not always in the same direction. It was frustrating. My luck changed on 10 March. Upon my arrival at the site at 4:00 p.m., I found the owl on top of the tree. It soon flew away to the east and several minutes later I found it on top of the secondary perch tree. At 4:30 p.m., as I was making my way back to the PPT, the owl came flying through the woods with a vole in its talons, then fluttered down to perch only 1.2 m (4 feet) above the snow on the broken end of a leaning deadfall.

Here, to my delight, for the owl was now only about 9 m (30 feet) from me, it proceeded to eat part of the vole, first plucking off bits of skin and fur that floated away. When my dog came trotting by directly under it, the owl slowly flew away with the remains of the vole. On the snow beneath this perch, which was streaked with whitewash, I found several pellets, plus a heavy deposit of feces in a slight depression — this had the appearance of a nocturnal roost-site! Repeated defecation had melted the snow which then refroze to a hardened layer of feces and ice. If not actually an overnight roost-site, it was clear that the site had been used several times for feeding and resting. Hurriedly looking about for the telltale whitewash on limbs and twigs, I quickly found five similar stations, all within a relatively small radius. Before long I had gathered 36 pellets. I was elated. Prior to this time I had found only 20 pellets altogether.

It was now getting late, so I headed out; on the way, I found the Northern Hawk Owl part way up the primary perch tree. A few minutes later, at 5:00 p.m., it went to the top. At 6:20 p.m. and again at 6:30 p.m. it sang briefly, short mellow bursts lasting 5-10 seconds. At 6:38 p.m. it fluttered down and low through the trees to the east. I guessed that it was heading for the roost area about 50 yards away. I had first noted it singing on 5 March. That day, I arrived at 5:30 p.m. and heard it sing, a tremulous, warbling call, at 6:05 p.m. The call lasted about 15 seconds. The owl sang every 2-5 minutes up to 6:20 p.m., its whole body quivering with the exertion. At 6:35 p.m. it flew off. In 1919, Alberta naturalist A.D. Henderson noted (quoted by Bent) that: "The calls ... are a trilling whistle, wita-wita-wita, etc., which is the love call of the male. I have never heard it uttered by the female. It is one of the signs of early spring, being first heard in February and

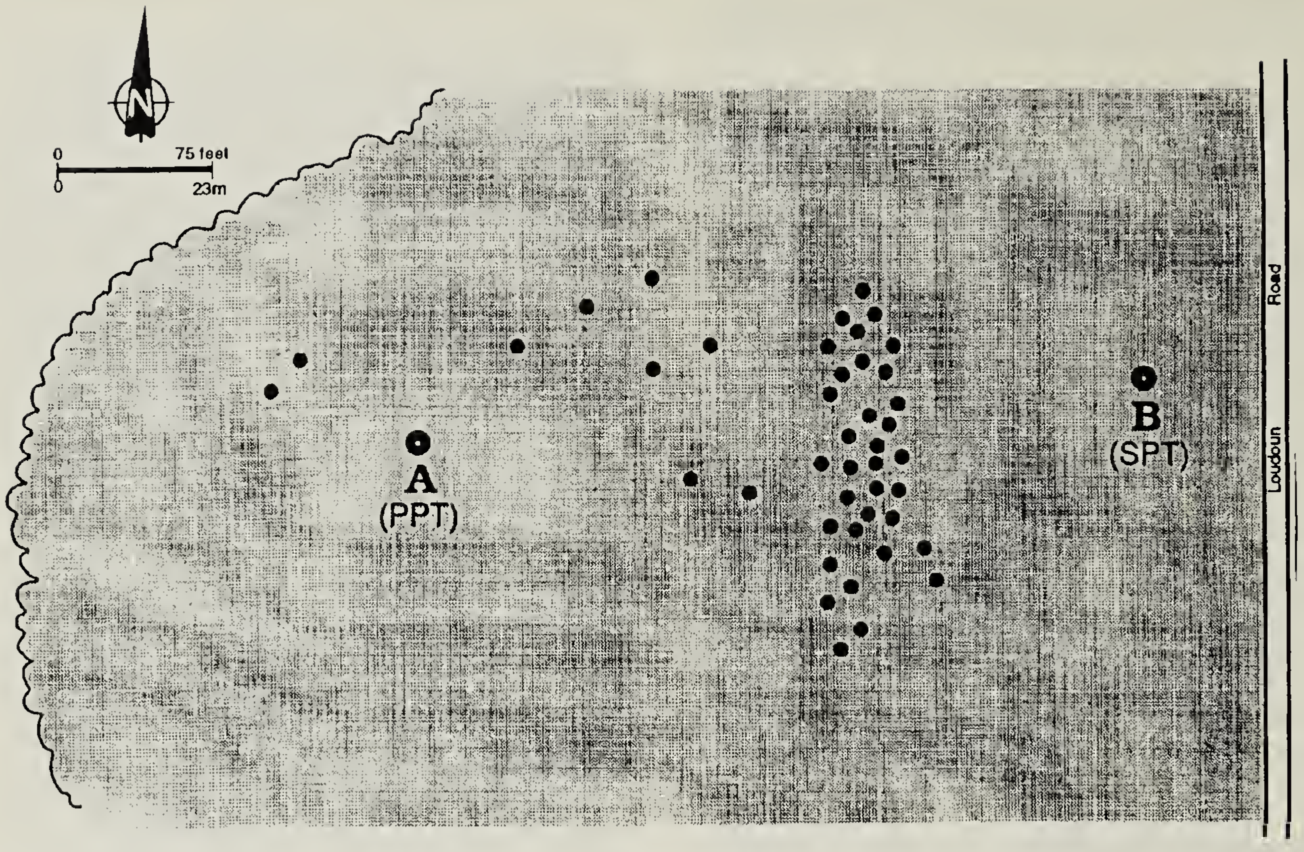

Figure 2. Primary perch tree (PPT) - A; secondary perch tree (SPT) - B; and associated roost-feeding sites for a Northern Hawk Owl wintering in Winnipeg, MB, 19 December 1993-18 March 1994 (based on field measurements).

through March and April."[2] Voous states: "Its trilling territorial song comprises a high-pitched, monotonous series of whistles ... resembling the sounds hoo-hoo-hoo-hoo or ululu. It is the call from which Linnaeus is supposed to have derived the bird's specific name *ulula. ...*"[13]

Two days later, by digging through the compacted snow at the same roost sites, I collected 22 more pellets. In the end, by searching the entire woods, I discovered that the majority of the roost sites lay within a concentrated area of about 54.8 m x 18.2 m (60 yards x 20 yards) (see Figure 2), approximately 45.7 m (50 yards) east of the primary perch tree. I flagged each site, and by digging down through the snow and frozen feces at these sites with a garden trowel, and by repeated visits as the snow melted away, collected more than 100 pellets. Several sites later were flooded to a considerable depth by meltwater, but even then I was able to find a few pellets under water. Other sites were examined after the snow disappeared and exposed the ground surface. In a few instances I chopped pellets out of the ice. Most of the pellets, however, were found in the snow, and I believe that they had been dropped only after there was snow on the ground. This would fit with the apparent arrival of the owl on 19 December.

Judging from the number of pellets found, roost-sites within this close array were each used on from one to eight nights. Most of the additional roost-sites found at various distances from this point had only one pellet, suggesting limited use. A few pellets, mostly small ones, were found beneath the PPT and SPT. Feeding or roosting perches (or a combination) were on aspen deadfalls, old fallen willow clumps, and close to the trunk on branches of live aspens of various sizes. Actual perches, as identified from whitewash on twigs, trunks, etc.,

Table 1. NORTHERN HAWK OWL PREY ITEMS RECOVERED FROM PELLETS FOUND IN WINNIPEG 19 DECEMBER 1993 - 18 MARCH 1994

Species	Number	% of Total
Short-tailed Shrew	2	0.8
Meadow Vole	248	98.0
Red-backed Vole	2	0.8
Deer Mouse	1	0.4
Total	253	100.0

appeared to range in height from 0.9-3.3 m (3-11 feet) above the snow, with a majority in the 1.5-2.2 m (5-8 feet) range. The primary perch tree top was visible from most of these sites. The evidence suggests that the owl, in the apparent absence of a tree cavity in this woods (if, indeed, they roost in cavities), spent each night perched at one of these roost-sites.

Assuming that the Northern Hawk Owl arrived on or about 19 December, and departed on 18 March, it was resident for about 90 days. The more than 250 prey items recovered (Table 1) must, therefore, represent a good portion of its intake during that period. Generally, owls regurgitate one pellet daily, though this varies with the timing of ingestion of prey. Thus, the more than 100 pellets collected probably account for a majority of the pellets cast by this bird. A few pellets up to 7.6 cm (3 inches) in length contained remains of four animals; a dozen or more pellets held three. The majority held two animals, with many small pellets holding only one. Generally, smaller pellets were found under perches out in the open, places where the owl spent less time. The larger ones were found mainly beneath the presumed night roost-sites.

The appearance of undigested parts in several pellets was noted. Whole tails, feet, vertebral columns still linked by tendons, even strips of flesh on a few leg bones were found, suggesting a surfeit of food. An uneaten posterior half of a Short-tailed Shrew left lying on the snow surprised me, as did a vole, the foreparts of which had been picked clean; the owl had even carefully picked the brain out of the cranium before dropping the carcass. I assumed that these were the Northern Hawk Owl's discards for they were found under trees that it frequented.

The total number of prey animals recovered from pellets was 253 (see Table 1). The Northern Hawk Owl was present for at least three months or approximately 90 days (19 December-18 March). Hence it would appear that minimally it consumed about 2.7 prey animals daily. Two to three voles may not seem like a lot for a bird that is capable of taking prey as large as ptarmigan, but voles weigh an average of 45 grams (pers. comm. J. Duncan). When captured for banding on 13 March, the Northern Hawk Owl weighed 350 grams. The high percentage of Meadow Voles in the sample is not unexpected, given the abundance of this species in this region at the time. Lane and Duncan found that Meadow Voles were prominent in the diet of Northern Hawk Owls during the breeding and non-breeding season.[8]

When Jim and Patsy Duncan were available on 13 March, we decided to make one more attempt to capture the owl. Armed with a mounted Great Gray Owl from the Wildlife Branch, live mice, Bal-Chatri trap, etc., we met at the area at 3:00 p.m., but the owl was nowhere in sight. I had wanted to show the roost-sites to the Duncans, so we walked into the woods. And there, first spotted by Patsy at one of the roost-sites, sat the owl, only about 7 feet (2.1 m) above the snow. Leaving Patsy to keep an eye on the owl, Jim and I raced back to the cars for the gear. It was a dark day with a strong south wind and a little rain, but I had the mounted bird in a black plastic bag, so back we went to catch the owl. Two live mice in the trap placed on the snow within 20 feet (6 m) of the owl drew little response. Next we strung a mist-net and unveiled the Great Gray Owl. The Northern Hawk Owl flew a few feet towards the mounted bird, then stopped as if uncertain how to respond. Finally, remembering that I had a piece of snare-wire in the car, I hurried back again. By the time I returned, Jim had an 8-foot (2.4 m) branch ready. We hastily fastened a snare on the end of his pole, then, while I tried to divert the owl's attention with the mounted bird in my arms, Jim attempted to slip the noose over the little owl's head. Each time the wire brushed against its head the owl ducked away, but it stayed on the perch. Finally the snare worked, we had the owl. An immature male, we took it back to the cars to band, then returned to the woods to release it in the same place. Three minutes later, after preening its plumage, it turned to face us as if wondering what was going to happen next.

The next day, I heard it singing early in the morning in the vicinity of the primary perch tree. On the following day, 15 March, I spent 10 hours in the area (7:10 a.m.-4:30 p.m.), staying within sight of the owl for a good portion of that time. When I arrived, the owl was on its primary perch tree. At 7:20 a.m. it sang once, then a few minutes later it disappeared. At 8:30 a.m. I discovered it in the elms to the west (see Figure 1) where I hadn't seen it for a month. It sang strongly from there at 8:45 a.m., then flew north to perch on a dead tree in an aspen clump where I'd never seen it before (and there were no feces underneath). At 9:00 a.m. it sang repeatedly from this tree and I noted that it "seems agitated." Shortly, it flew to a hydro pole at the east end of Peace Road, on the way giving a "bridling" display, that is, gliding on outspread set wings with its head raised. I've seen Great Gray Owls do this occasionally, and have interpreted it as a territorial display.

The Northern Hawk Owl soon returned to the same elm tree (9:04 a.m.) then slipped out of my sight (9:15 a.m.). It reappeared over the north aspen grove, and for three minutes alternately flapped and glided, "planing like a Mourning Dove." In this mode it circled three times at a height of perhaps 50 feet (15 m) around a microwave tower (Fig. 1-D) before returning to the elm. Then, facing the tower, thus looking to the north, it sang again (9:28 a.m.) and two minutes later sang even louder. I didn't know what to make of this. Was there a nest tree to the north? Did it have a mate in that woods? Was it going to leave? It was reassuring to watch it fly back "home" to the primary tree at 9:35 a.m. For the rest of the day I searched in the main woods for other roost-sites, paced off the area, etc., noting that the owl was on and off the PPT at intervals.

I returned to the area two days later (17 March) at 3:20 p.m. An hour later the owl appeared on the PPT, then at 4:40 p.m. it flew low through the trees to the northeast. Hurrying in that direction, I found it perched on a branch of a small dead tree, about 2.4 m (8 feet) above the snow. A dead vole I'd found along the way on a snowmobile track lured the owl to within 20 feet (6 m) after I tossed it onto the snow several times. I then draped it over a branch. The owl stared hard at the vole, then turned and flew back to its original perch on the dead tree. Seconds later it flew onto the trunk of that tree like a woodpecker and, to my surprise and delight, withdrew the posterior half of a dead vole from a hole in the tree. (Later, I found another dead vole on the ice beneath this site, presumably a prey item that had fallen from the hole.) The hole, about an inch (2.5 cm) wide and 3 inches (7.6 cm) high, appeared to be an old excavation made by a woodpecker. The owl carried its half-a-vole 15 m (50 feet) to another perch (used before, for I later found whitewash and a pellet underneath the tree) to feed on it. Despite the noisy snow, frozen overnight, I was able to approach to within 2.7 m (3 yards) of the owl, perched some 2.4 m (8 feet) above the snow, so I had a good view. First, he removed and dropped the entrails, then peered down as if annoyed, for the gut-string was swinging from a twig it had fallen onto. As the owl pinched off bits of skin and fur (found at several feeding stations) and nibbled at the vole's flesh, I realized that this was a fastidious eater. (Judging by the numerous badly crushed skulls in its pellets, it spent some time nibbling the heads of its prey. Often, especially in large pellets containing more than one prey item, only the palatine bones and molars were intact. Whole crania, with mandibles still in place, tended to occur in smaller pellets. I learned this in the process of picking the crania and mandibles out of the 100 plus pellets.) When my dog passed below the owl showed no special concern. After completing his meal, the owl cleaned his bill, rubbing it vigorously on the branch it was on. It flew off only when I tried to get closer, heading back to the PPT.

Earlier, on 22 February, I'd seen the owl peer into another woodpecker excavation. At 4:45 p.m., I found the owl perched on an oak east of its usual woods, across the road, an area where I'd seen it fly for a brief period on a few previous occasions. I thought perhaps this was where it roosted, for late one evening it seemed to head in that direction. From the oak tree it fluttered down to an old decayed aspen stub and then peered into a cavity about 2.7 m (9 feet) up that I hadn't noticed before. The hole was about 5 cm (2 inches) wide and 7.6 cm (3 inches) high. The owl looked back at me, and I foolishly thought it was showing me its roost site. It fluttered away, low and slow, to an old broken aspen, so I hurried to look for signs of use below the cavity tree, but there was nothing. I watched the owl for the next half hour as it moved in the same slow flight from one perch to another, calmly preening between flights. I could find no whitewash at any of these perches. At 5:25 p.m., it flew back across the road and up to the PPT. Only after seeing the owl pull the half-a-vole out of the cavity (above) did I realize that these were cache sites, places in which to hide excess captured prey. A recent report by McNair of caching in the Northern Hawk Owl overlooked an account of this behaviour by Patsy and Jim Duncan; the Duncan's observed Northern Hawk Owls "caching prey items on several occasions, before and during nesting."[8,10] McNair watched a Northern Hawk Owl, a bird he presumed to be off its breeding grounds, eat the anterior half of a vole, and then store the remaining half on top of a telephone pole.[10]

All winter long, I'd reminded myself that one day the Northern Hawk Owl likely would leave to return to its presumed far northern breeding grounds. Part of my reason for visiting the area daily, especially late in the season and after we had banded it, was to try and record its last day here. As it happened, I was fortunate to be watching the owl at apparently the very time it departed. This was on 18 March. When I first found it that day at 3:45 p.m., the owl was on the primary perch tree, but below the top. At 3:55 p.m. he gave a big stretch, first with one wing down, then with both wings overhead while stretching his tail. My notes read: "4:45 — he's up on top of the tree; 4:58 — he twitches his tail, very alert, looks ready to leave the tree; 5:02 — he turns and flies off, dropping down fast to the north." I hurried after him, not yet aware what he was up to, making my way through the wet snow and water out into the open. I couldn't see him, but a few minutes later I discovered him perched atop a large spruce tree beside a house about 440 yards (402 m) to the northwest (Fig. 1-E). Heading that way, and wondering what on earth he was doing in that yard, where I'd never before seen him, I saw him drop away, flying low to the north. It was my last glimpse of the Northern Hawk Owl. After first going back to check the primary perch tree (thinking that he might have eluded me and returned), I drove around for 40 minutes, searching the area for 3.2 km (2 miles) to the north. I thought perhaps I might still find him somewhere, but at 5:45 p.m. I noted: "I think he's gone up north!" To verify that the Northern Hawk Owl had left the area, I checked the area daily for the next four days and returned irregularly for several days thereafter. The owl was not seen again.

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SALINE LAKE LIMNOLOGY — SASKATCHEWAN STYLE

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Saline lakes are found on every continent. They make up almost 50% of all world lakes in both surface area and volume.[20] In Saskatchewan they are found in the southern part of the province within the grassland and parkland vegetation zones (Fig. 1). These saline lakes (about 535) make up only about 0.7% of the Saskatchewan lake total,[6] in contrast to many parts of the world (Australia, the Asian portion of the old USSR, Iran, southwestern United States, Kenya-Tanzania) where saline lakes predominate.[4]

Salinity, Climate and Geology Lakes are defined as saline if they contain 3 grams per litre or more of dissolved salts.[21] This may be compared to 0.5 g/L or less salt in potable drinking water (fresh water) and an average of 35 g/L salt in sea water. The single most important determining factor is climate as saline lakes are usually found where

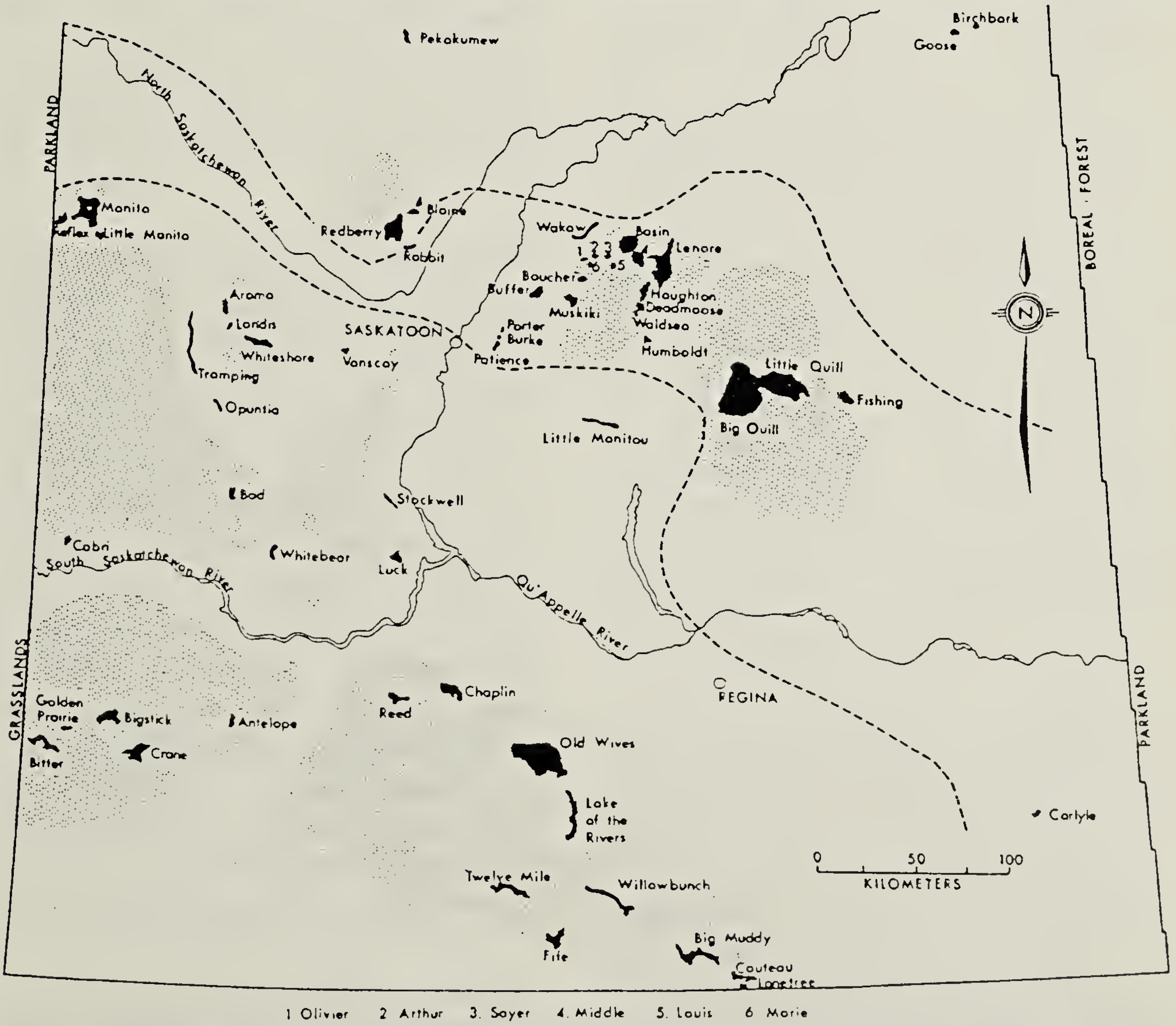

Figure 1. Southern Saskatchewan showing the location of saline lakes (black), vegetation zones, and endorheic drainage basins (stippled).[12]

evaporation exceeds precipitation. In Saskatchewan suitable climates are semiarid in the southwest (grasslands) and subhumid (aspen parkland) further north and east. Average annual precipitation in southern Saskatchewan varies from 30 to 40 cm while evaporation may range from about 100 cm annually in the Lake Chaplin area to lesser amounts to the north and east. The major source of water for lakes in southern Saskatchewan is from snowmelt runoff. Although lake depths and volumes increase directly through rainfall, significant influent runoff from a drainage basin surrounding a lake does not occur unless there is heavy or prolonged rainfall. About 60 lakes with areas greater than one square kilometre have been described[9] as to location and structure. The largest in area is Big Quill Lake (307 km^2) while the deepest is Deadmoose Lake (48 metres). However, saline lake mean depths do not exceed 10 metres and many are very shallow.

The lakes are located on glacial till that have fine clay sediments in lake bottoms permitting water retention. Saline lakes are located within endorheic (internal) drainage basins and do not flow out into larger rivers and then into the sea as do northern Saskatchewan river systems. This allows the salts derived from soils rich in minerals to be dissolved in runoff waters and retained in lakes where they are concentrated when

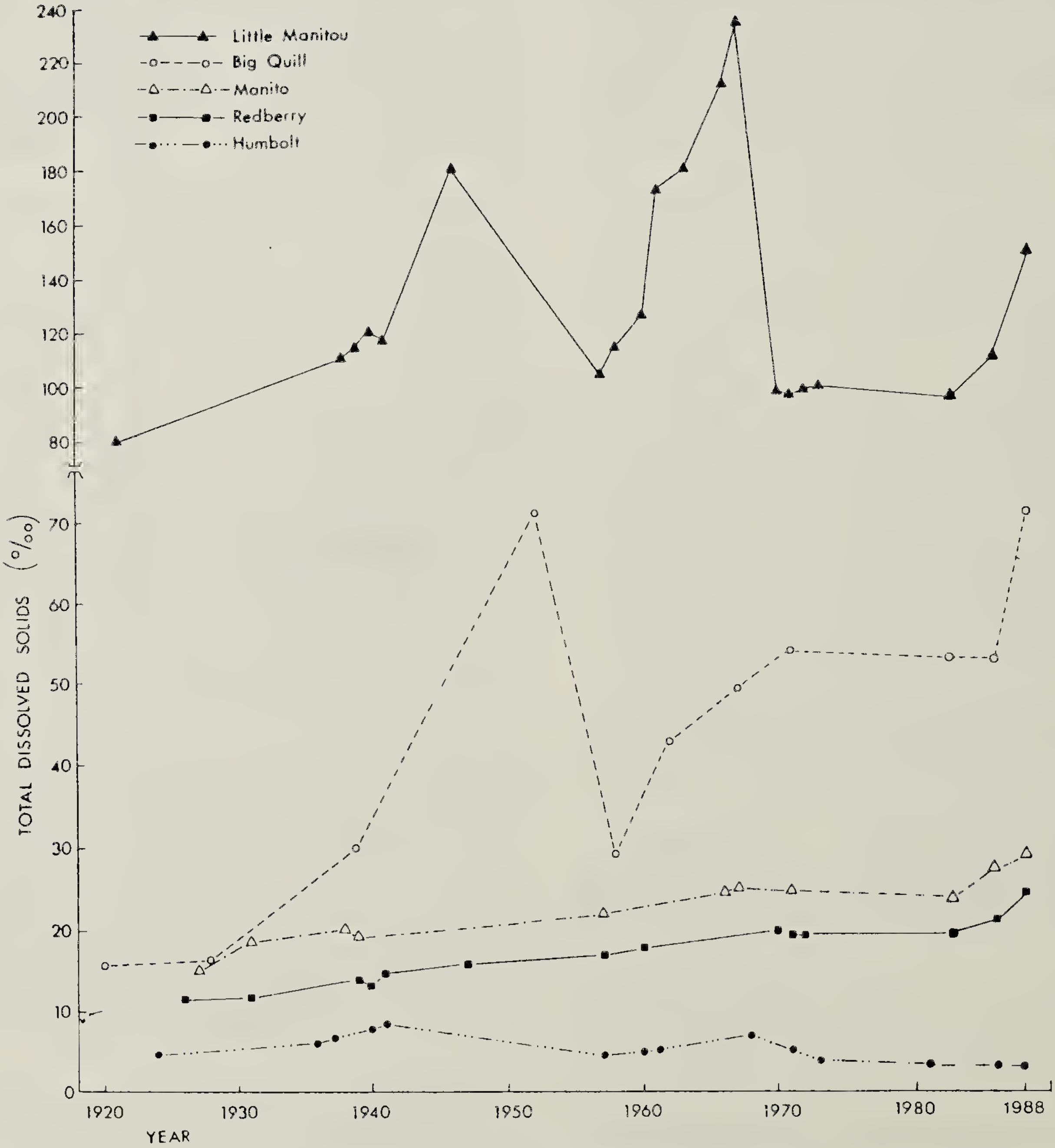

Figure 2. Long term changes in total dissolved solids (=salinity) in five Saskatchewan lakes, 1920-1988.[6]

evaporation occurs, that is, the waters become saline. Thus fluctuation in precipitation, water inflows and evaporation all contribute to changes in lake water salinity (Fig. 2). The droughts of the 1930s, 1960s and 1980s resulted in increasing lake salinities, while high precipitation particularly in winter snowpacks during the 1950s and 1970s decreased lake salinities. The greater the salinity, the greater the long-term fluctuations, e.g. Little Manitou Lake. Shallower lakes such as Big Quill Lake also fluctuate more than deeper lakes such as Manito and Redberry lakes. Low salinity lakes like Humboldt and Wakaw fluctuate relatively little in salinity. Seasonal changes in salinity also occur as salinity increases from spring to fall. More saline and shallow saline lakes tend to increase more in salinity seasonally, while lakes such as Humboldt show little change. Salinities range from slightly saline Humboldt and Wakaw lakes to highly saline Big Quill, Little Manitou and Patience lakes. Patience Lake has had more than 10 times sea water salinity.

Water Chemistry The chemical constituents of Saskatchewan saline lakes are dominated by the cations sodium and magnesium, with calcium and potassium at much lower levels.[3] Sodium tends to be dominant in most of the world's saline lakes. (Potassium is second to sodium in Patience Lake which derives much of its salts from potash mine wastes on its shores.) The anion which dominates is sulphate, with chloride or carbonate/bicarbonates secondary. Chloride from potash mine wastes is the dominant anion in Patience Lake. Saskatchewan fresh waters are primarily sodium bicarbonate-carbonate.

The important nutrients phosphorus and ammonia are usually abundant in saline lakes. These lakes are also alkaline in Saskatchewan with the pH range from 7.5 to 10.00.

Physical Factors Light penetrates deeply into clear lakes like Redberry but is absorbed very quickly in turbid lakes such as nearby Rabbit Lake.[9] Turbidity is caused by inorganic and organic matter stirred up from shallow lake bottoms or by the growth of algae and bacteria in the waters and by pigments leached out of plant materials.

Deeper lakes stratify thermally so that the bottom waters remain cold all year round, e.g. Redberry, Manito, Deadmoose. Shallow lakes are mixed by the wind and warm up throughout with increasing light and air temperature.

Water temperature varies from 0°C under the ice up to 30°C in shallow surface waters in summer. In southern Saskatchewan the winter ice cover usually reaches about one metre thick whether the lakes are fresh or saline. As the temperature drops to just above freezing, salt precipitates out as sodium sulphate so that saline lake water is then much fresher and can freeze. This principle is used to harvest sodium sulphate, e.g. at Chaplin. An exception occurs in Patience Lake.[11] Chloride salts in this lake are highly soluble so that the freezing point is depressed and the lake does not freeze until its water reaches about -25°C!

Five Saskatchewan saline lakes in the Humboldt region (Deadmoose, Waldsea, Sayer, Marie, Arthur) are or have been meromictic[8] (lower water in a lake is heavier than water nearer the surface). This happens when fresh water flows in over the top of more saline waters, as when snowmelt waters flow in during spring runoff. If enough fresh water enters, the lighter surface waters cannot be mixed by the wind with the heavier lower waters. There is a marked transition, chemically, between the two zones (chemocline) and the lake is said to be meromictic. No oxygen is present in the lower denser waters so life there is limited to large populations of anaerobic bacteria.

Lake Biology The flora and fauna present in saline lakes are determined by the broad range of salinities. The greatest number of species in any group of organisms occurs in lower salinities. Of particular interest is the fact that the most species occur in the transition zone, around 3 g/L.

Algae Algal populations are the basis of the food chain in lakes. Algae from 41 Saskatchewan saline lakes have been identified and discussed.[12] Two hundred and twelve species and varieties in 7 phyla, 8 classes, 42 families and 91 genera

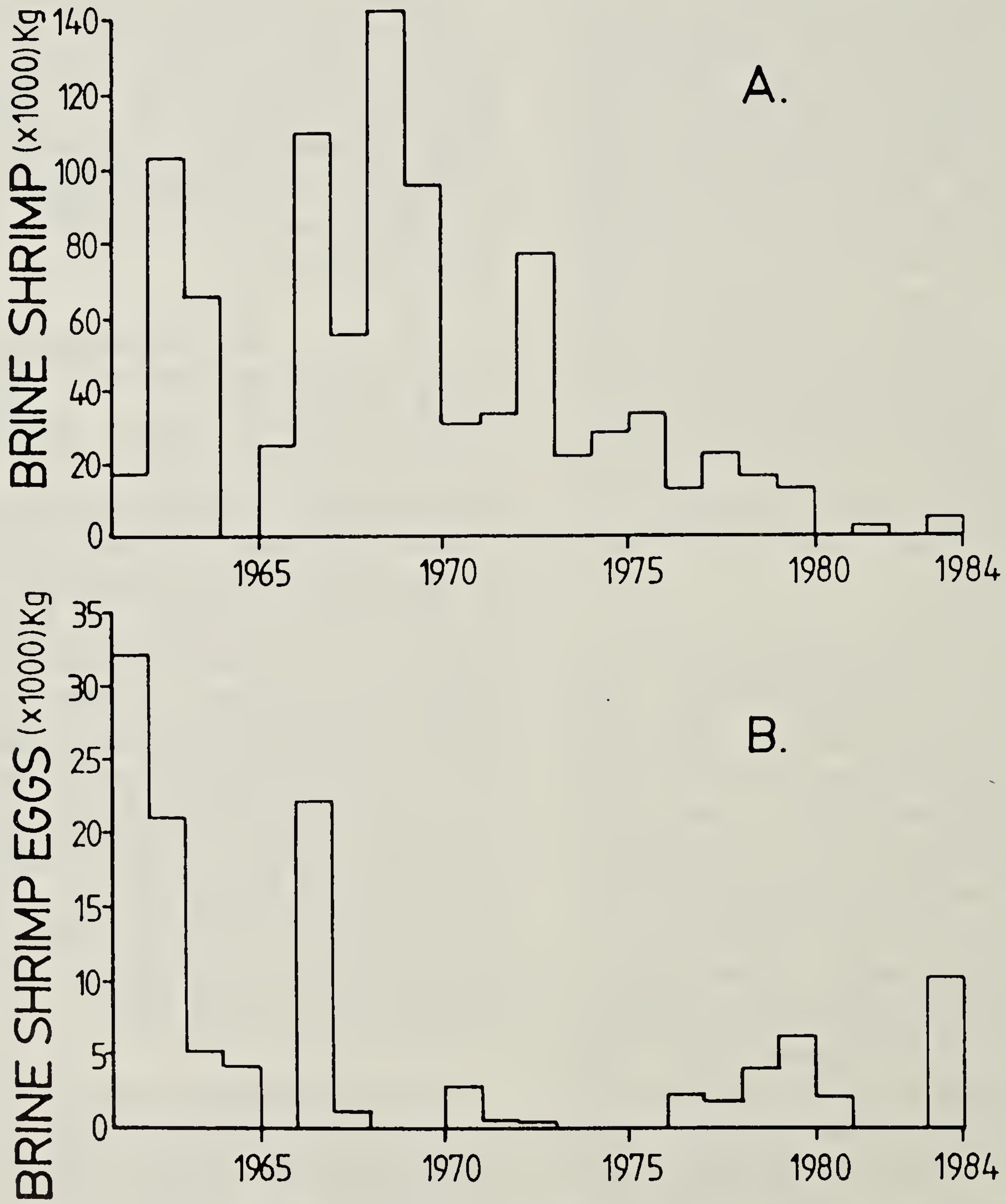

Figure 3. Typical algal species: green algae A. Cladophora crispata *(Big Quill L.), E.* Pediastrum Boryanum *(Humboldt L.); diatoms B.* Stephanodiscus niagarae *(Manito L.), F.* Navicula cincta *(Little Manitou L.); C. the flagellate* Ceratium hirundinella *(Wakaw L.); D. blue-green algal bloom in Humboldt L.(*Anabaena flos-aquae, Lyngbya Birgei, Microcystis aeruginosa*).*

were identified. Fourteen species were restricted to hypersaline (50 g/L or more) waters and 11 of these were diatoms. Twenty-five species were abundant in low salinity waters (3-5 g/L) — 9 diatoms, 6 greens, 8 blue-greens and 2 dinoflagellates. Blue-green algae such as *Aphanizomenon flos-aquae, Microcystis aeruginosa and Anabaena flos-aquae* are common sources of water blooms (so dense they colour the water) and are also abundant in fresher waters such as in lakes of the Qu'Appelle River Valley.

Highly saline lakes (Muskiki, Chaplin, Little Manitou, Deadmoose, Waldsea) were dominated by populations of diatoms and green algae. In less saline lakes (<10 g/L), such as Humboldt, Lenore and Wakaw, diatoms dominated in the spring and fall and blue-greens in the late spring through fall.

The rate of primary productivity decreased with increasing salinity.[14] The highest rates were associated with algal blooms: *Aphanizomenon flos-aquae, Microcystis aeruginosa, Stephanodiscus niagarae* in Humboldt Lake; *Nodularia spumigena* in Manito Lake. Mixed populations rather than specific algal blooms occurred in other lakes (Fig. 3). The productivity in Humboldt Lake is one of the highest ever measured anywhere. High concentrations of nutrients, including phosphorus and nitrates from sewage effluent and farmland and feedlot runoff, are the basis for the high production. The 613 g C/m^2/yr is roughly equivalent to a wheat crop of 100 bushels of wheat per acre.

Bacteria Photosynthetic sulphur bacteria have only been examined in the meromictic lakes, particularly Waldsea and Deadmoose lakes.[15,16] These bacteria were most abundant in a layer referred to as the bacterial plate present in the chemocline. This is a zone of low light, no oxygen and cold water. In the process of photosynthesis, hydrogen sulphide is converted to sulphate as carbon is assimilated. No oxygen is produced as in algae and higher plants. *Chlorobium sp.*, a green sulphur bacterium, was dominant in Waldsea Lake. The water of the plate was coloured pinkish brown. The bacteria actively photosynthesize the whole year even under the ice. The plate was relatively thin, only about 0.4 m, located just above a depth of 8.0 m. In Deadmoose Lake the dominant photosynthetic bacterium was *Lamprocystis roseopercicina,* an anaerobic purple sulphur bacterium. It grew at a deeper depth (below 8.8 m) where there was less light energy and the water was colder (below 4°C). Because these two species have slightly different ecological requirements, they are abundant in two lakes under different environmental conditions. Both bacteria occurred in each lake but one was always dominant.

Higher plants Rooted aquatic plants occur over a broad range of salinity.[10] Submersed species also require enough light for photosynthesis. Only three submerged species (the fennel leaved pondweed *Potamogeton pectinatus,* the ditch grasses *Ruppia maritima* and *R. occidentalis)* occur in lakes greater than 5 g/L salinity. The first two live in the hypersaline waters of Big Quill Lake (53 g/L). *P. pectinatus* and *R. occidentalis* occur in Wakaw and Humboldt lakes but are also common in subsaline lakes. In saline lakes such as Redberry they were found down to a depth of 8 metres and were, presumably, light limited below this depth. These species provide habitat for fish and other aquatic animals as well as food for others such as ducks. A few other submersed species occur only in low salinity waters, e.g. the water milfoil

Myriophyllum exalbescens.

Quite a few shallow water emergents were found to grow over a broad range of salinity. *Scirpus paludosus* (prairie bulrush) and *Triglochin maritima* (arrow-grass) were present over the entire salinity range investigated from Wakaw Lake to Whiteshore Lake. In the latter lake plants were growing in water where the salts were crystallized around the plant parts in the water. Both species looked very healthy. Seeds of both species are very important food sources for ducks. *Scirpus americanus* and S. *acutus* occur in less saline but not subsaline waters. Two marginal emergents that grow in highly saline Muskiki Lake are *Distichlis stricta* (alkali grass) and *Puccinellia nuttalliana* (salt-meadow grass) but were also in slightly saline Porter Lake. Species such as *Eleocharis palustris* (spike-rush), *Hippuris vulgaris* (mare's tail) and the cattail *Typha latifolia* were restricted to low salinity waters as in Wakaw and Vanscoy lakes.

Many species invade lake substrates when the water recedes but normally do not grow in the water. *Salicornia rubra* (samphire), initially dark green, is the most spectacular when it matures with its bright red succulent foliage. Apparently, Natives used it for food seasoning. It occurs

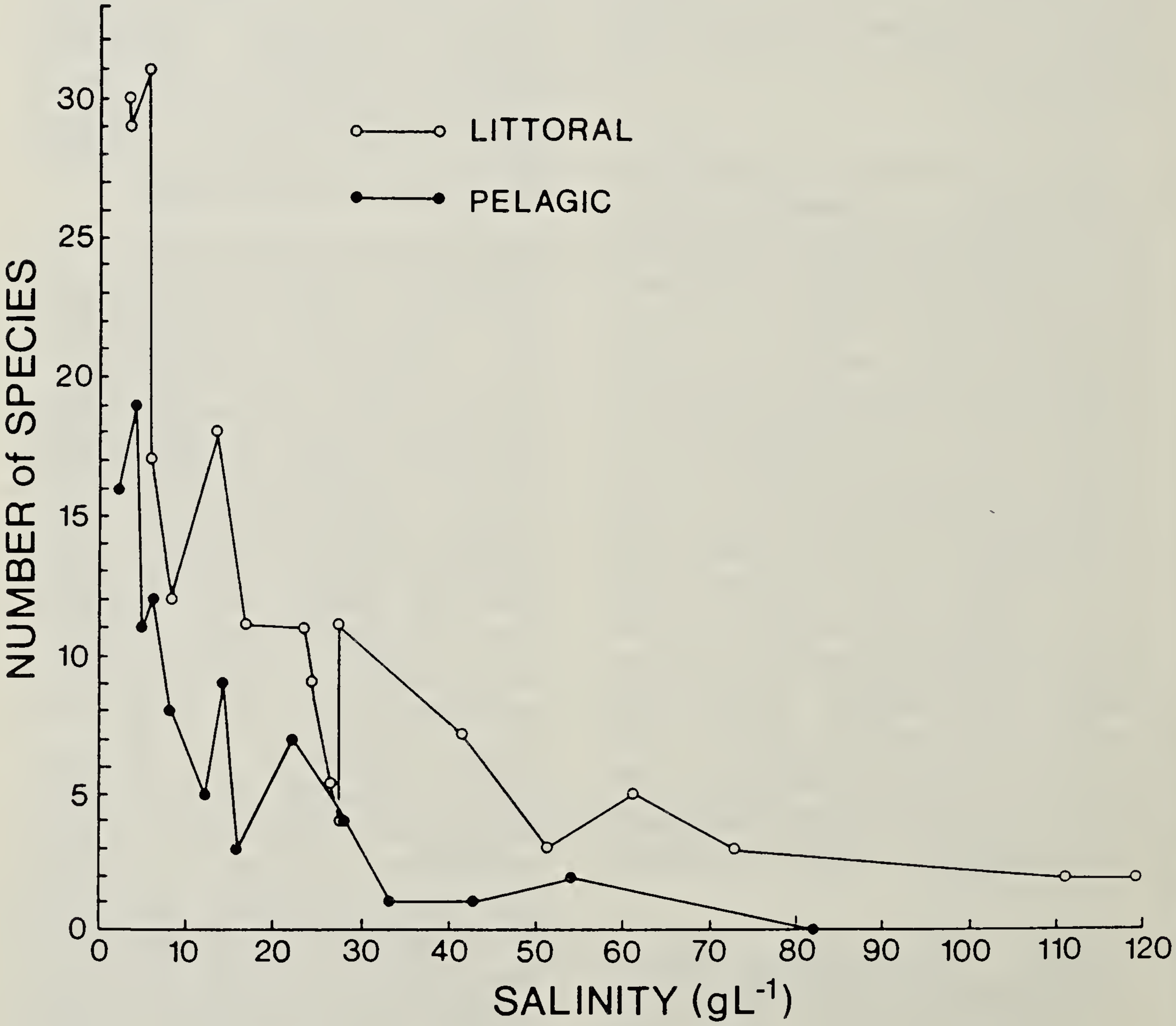

Figure 4. A comparison of species richness according to lake salinity in the littoral and pelagic zones of saline lakes in Saskatchewan and Alberta.[13]

in abundance around lakes such as Little Manitou, Redberry, Chaplin, Muskiki, Deadmoose and many others and is particularly obvious in the autumn. Goosefoot (*Chenopodium rubrum*), fox tail (*Hordeum jubatum*) and sow thistle (*Sonchus arvensis*) are also invaders in lower salinity soils such as beside Wakaw Lake.

Bottom fauna Benthos are animals which live on or in the bottom muds or on plants growing on the substrate. They are very important to lake ecology as they provide food for fish as well as waterfowl in shallower waters.

Twenty-three species were found in the deeper (pelagic) waters of 20 saline lakes in Saskatchewan and Alberta (Gooseberry, Killarney),[19] 18 species in >10 g/L, 10 in >20 g/L and only two in >50 g/L salinity lakes (Fig. 4). The amphipod (sideswimmer, scud) *Hyalella azteca* and the chironomids *Procladius freemani, Chironomus* nr. *muratensis* and *Cryptochironomus spp.* were most abundant in lower salinities (in up to 12 g/L), whereas the chironomids (midges) *Tanypus nubifer, Cricotopus ornatus* and *Chironomus* nr. *annularis* dominated at moderate salinities (5 to 30 g/L). Dolichopodid and ephydrid dipterans (flies) were the only species in hypersaline (50 g/L) deeper waters. Except for the sideswimmers, the other species are insects which spend their adult lives, usually short, out of the water while the immature stages are in the water where they may live as larvae for up to a year or more.

The pattern of species richness in shallow near shore (littoral) zones[13] tended to follow a similar pattern to that in deep waters but the number of species was higher in each lake. Seventy-six species were identified in 18 lakes. In the lowest salinities (Wakaw, Humboldt, Lenore) 29-31 species were present while only two species were present in highly saline Little Manitou Lake. Very high populations (1,000-10,000 or more per square metre) of amphipods (*Gammarus lacustris* and *Hyalella aztecta*), the ostracod *Megalocypris ingens* in Marie and Waldsea lakes, the chironomids *Cricotopus ornatus Glyptotendipes* and *Tanypus nubifer* and the water boatman *Trichocorixa verticalis interiores* were sometimes present.

Zooplankton These are the free-swimming microscopic animals present in the open water of lakes. They feed on algae or smaller zooplankton. The major groups are rotifers (wheel animalicules) and crustaceans including anostracans (such as brine shrimp), cladocerans (water fleas) and copepods. A total of 35 species were found in 20 lakes, including Gooseberry and Killarney in eastern Alberta.[7] Species richness was greatest in salinities <7 g/L with 14-16 species per lake. Lakes with 7 to 100 g/L salt had 6-8 species while 2-5 species were present in lakes over 100 g/L salinity (Aroma, Little Manitou, Whiteshore). The greatest densities occurred in lakes below 30 g/L salinity.

As with other saline lake inhabitants, salinity is not the only limiting factor with respect to species survival and abundance. Two species (the rotifer *Hexarthra polyodonta* and the cladoceran *Moina hutchinsoni*) are restricted to high pH waters, >pH 9.0. Other factors which are involved are the food supply, water transparency, water temperature and water depth, but the effect of these factors is difficult to quantify in the field.

The brine shrimp *Artemia* is the only zooplankton species that has been consistently harvested in Saskatchewan.[5] The adults are har-

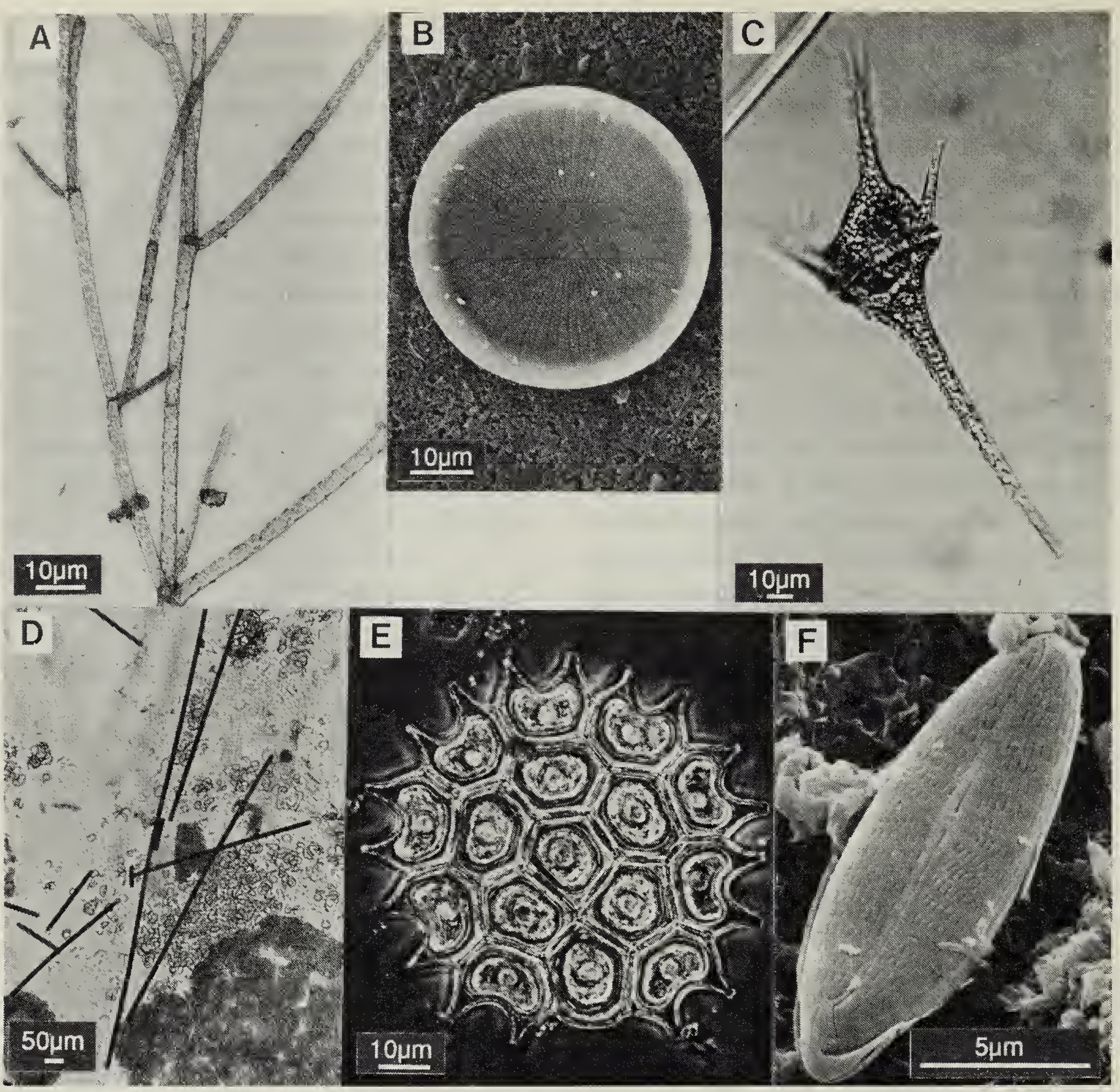

Figure 5. Annual harvest of brine shrimp (A) and their eggs (B) from Saskatchewan saline lakes.[5]

vested with nets and sold to feed tropical fish in aquaria. Eggs are also collected and sold to tropical fish growers who hatch them for food for young fish. Chaplin and Little Manitou lakes are the prime sources. The annual harvest and value of shrimp and eggs is significant (Fig. 5). The standing crop of shrimp in Little Manitou Lake in the summer has been estimated at 5 million kilograms.

Fish Hammer[5] and Atton[1] have discussed the occurrence of fish in saline Saskatchewan lakes. No endemic species occur in Saskatchewan saline waters which have 15 fish species that otherwise are present in fresh waters. Most of these species are restricted to hyposaline waters (>20g/L salt) but the Nine-spine Stickleback (*Pungitius pungitius*) tolerates salinities up to 30 g/L, as in Deadmoose Lake. The minnow family (Cyprinidae) contributes five species to saline tolerant fauna, the stickleback family (Gasterosteidae) two species, four species in the perch family (Percidae) and two trout species (Salmonidae).

Reproduction only occurs at lower salinities, usually 6 g/L or less, so in order to have gamefish populations in more saline lakes they have to be stocked periodically. Cisco and lake whitefish fry were stocked in the Quill Lakes during the 1920s and commercial netting was carried on from 1926-1930. Increasing salinity eliminated the populations after 1930.[18] Rawson[17] stocked Redberry Lake (15 g/L salinity) with whitefish in 1940 and 1941 because it had abundant food (amphipods). Commercial fishing began in 1946 and continued until 1981 when the salinity rose to >20g/L and the population succumbed. Stocking and commercial fishing of whitefish was also carried out in Basin and Lenore lakes. Over 700,000 kg of whitefish was harvested over the years, mostly from Redberry Lake.

Yellow Walleye fry were also introduced into Redberry Lake in 1941 and showed excellent growth.[17] However, survival was better in less saline lakes so stocking was diverted to them (Fife, Fishing, Humboldt, Lenore, Little Quill, Tramping, Wakaw lakes) and carried out every two-three years. Over 40 million fry have been stocked and have led to a very successful sports fishery in hyposaline lakes. Successful stocking of perch and northern pike in lower salinity waters <6 g/L) have been carried out periodically.

In the 1980s rainbow trout (*Salmo gairdneri)* fingerlings were cage-raised successfully in Redberry Lake in spite of its high salinity (>23g/L). Large-scale stocking was carried out in the spring of 1985 and excellent growth was noted in test netting late that year. However, spring netting in 1986 showed the complete absence of rainbows. It was determined that rainbow trout could not withstand the freezing point depression of the water temperature that occurred when the lake froze over in the autumn!

Birds Many species of waterfowl and other species of birds utilize saline lakes.[5] Many species use the lakes as staging areas during spring and fall migration (Sandhill Cranes, various species of geese, ducks, swans, Double-crested Cormorants). Of special interest is the use of Patience Lake, particularly in the autumn, as a staging area by Canada Geese. Other waterfowl seem to avoid this lake since it has been polluted by the potash industry. Large numbers of Northern Phalaropes use saline lakes like the Quills and Chaplin as staging areas in their annual migrations.

Characteristic of saline lake margins are a great variety of waders including the American Avocet, Piping Plover (most of whose world population nests in the vicinity of prairie saline lakes) and the Killdeer. Bird sanctuaries have been established on the islands of Redberry Lake to provide opportunities for reproduction for the White Pelican, but California and Ring-billed Gulls, Black and Common Terns and White-winged Scoters also nest and feed there.

Recreation The utilization of saline lakes by man must be considered. I have already referred to angling for gamefish as well as commercial fishing. The hunting of waterfowl is an important fall pursuit on the Canadian prairies. Saline lakes provide temporary refuges for waterfowl as well as resting and feeding areas during this time.

Saline lakes also provide recreational facilities for many people. Little Manitou Lake was the site of a leading resort village in the first half of this century.[2] It had many facilities

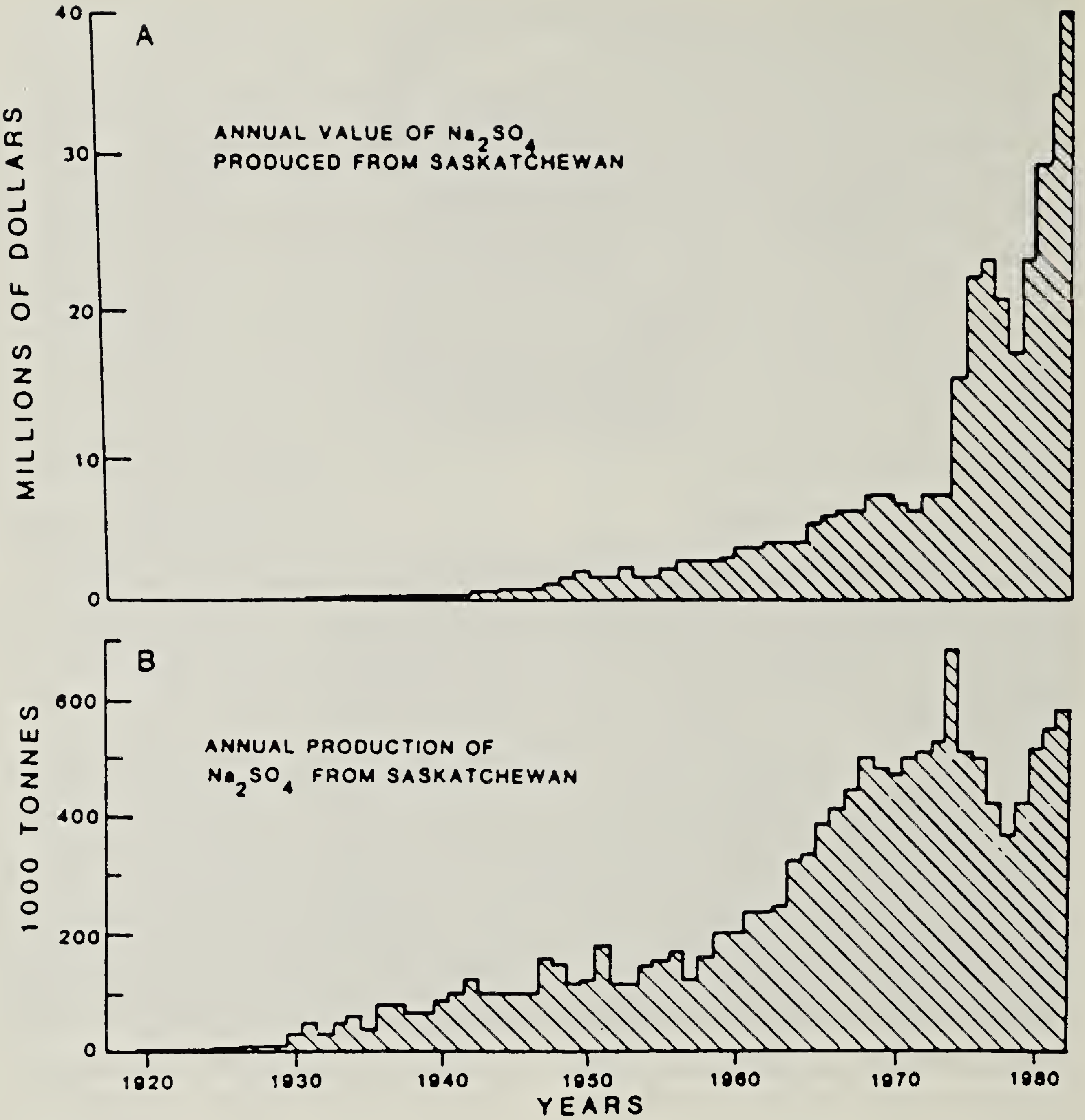

Figure 6. The annual value (A) and harvest (B) of sodium sulphate in Saskatchewan.[5]

besides swimming and sand beaches. These included chalet pools, dancehalls and other tourist facilities, and was considered a health spa. With the opening of roads to northern Saskatchewan during the 1940s and 1950s, interest waned. Recently, interest in the area has been renewed and new facilities including a large indoor pool have been constructed. Cottage complexes have long been a feature at Manitou Beach.

Regional parks with summer cottage complexes have been established at a number of saline lakes (Antelope, Cabri, Fife, Lenore, Little Manitou, Redberry, Tramping, Wakaw, Waldsea) where bathing and beach activities are available. Cottage developments are present at many other saline lakes including Humboldt and Manito. Potential resort development sites are at Basin, Big Quill, Little Quill and Lenore lakes.

Water activities are more attractive in many saline lakes because little algae is present and the water is usually clear. Sailing is an important pursuit in some lakes while power boating is less important. Humboldt

Lake has one of the most active water ski clubs in Saskatchewan. Canoeing and board sailing are widely practiced. Less strenuous pursuits include bird watching, photography, hiking and observing aquatic flora and fauna.

Minerals More highly saline lakes are major sources of minerals.[5] Eight plants harvest sodium sulphate (Fig. 6) which is used mainly in the pulp and paper industry which uses 20 kg per tonne of pulp produced. It is also used in the glass industry, in tanning and dyeing, in textile manufacturing and in detergents as a builder. Estimated deposits are 200 million tons, the largest deposits in the world. Big Quill, Little Manitou and Redberry lakes contain 2,200,000, 2,500,000 and 1,850,000 tons of magnesium sulphate respectively. Some is now being extracted from Big Quill Lake to produce chemical grade product. Epsom salts is another product while magnesium is a widely used metal. Commercial quantities of other minerals (potassium sulphate, magnesium chloride, halite, gypsum) are present but other sources are cheaper now.

Economics The saline lakes are worth millions of dollars annually to the people of Saskatchewan. Local people and tourists spend a great deal of money on sports fishing, waterfowl hunting and on recreational activities. The brine shrimp industry and the extraction of minerals has been developed by a number of businesses and provide good returns. Employment associated with saline lake investments is considerable.

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So important are insects and other land-dwelling arthropods that if all were to disappear, humanity probably could not last more than a few months. Most of the amphibians, reptiles, birds, and mammals would crash to extinction about the same time. Next would go the bulk of the flowering plants and with them the physical structure of most forests and other terrestrial habitats of the world. The land surface would literally rot. As dead vegetation piled up and dried out, closing the channels of the nutrient cycles, other complex forms of vegetation would die off, and with them all but a few remnants of the land vertebrates. The free-living fungi, after enjoying a population explosion of stupendous proportions, would decline precipitously, and most species would perish. The land would return to approximately its condition in early Palaeozoic times, covered by mats of recumbent wind-pollinated vegetation, sprinkled with clumps of small trees and bushes here or there, largely devoid of animal life: *Wilson, E.O. 1992. The diversity of life. W.W. Norton and Company, New York. 424 pp.*

INSECTS

TYPE LOCALITIES OF TWO SATYRID BUTTERFLIES

NORBERT G. KONDLA, Box 762, McBride, BC. V0J 2E0

The purpose of this note is to clarify and restrict the type localities of two butterfly taxa: *Oeneis nahanni* (Nahanni Arctic) which is placed as a subspecies of *O. Uhleri* in contemporary literature and *Coenonympha mackenziei* (Mackenzies' Ringlet) which is variously placed as a subspecies of *C. ochraces* or *C. tullia* in contemporary literature.

Dyar loosely gave the type locality for *O. nahanni* as "Nahanni Mtns., Mackenzie."[3] This vague and largely useless type locality description has been perpetuated in the literature despite the fact that the collector of the type material gave a very accurate description of the type locality.[1]

Cary reported collecting the type pair on Mount Tha-on-tha, Nahanni Mtns., Mackenzie. He also reported that this mountain is "an isolated peak not more than 5 miles from the confluence of the North Nahanni and Mackenzie Rivers." Further, he reported that the literal translation of the Slave Indian "Tha-on-tha" is "by itself." National Topographic System map sheet 95J shows that this mountain is now called Lone Mountain and is located at about 62°11' N, 123°16' W.

Cary also referred to the Nahanni Mtns. as being "an eastern spur of the Rockies." It should be noted that Lone Mountain is in fact the northern terminous of the Nahanni Range which is part of the Mackenzie Mountains.

The type locality of *Oeneis uhleri nahanni*, using modern geographic names, is therefore restricted to Lone Mountain, Nahanni Range, Mackenzie Mountains, Northwest Territories.

Davenport gave the type locality of *C. mackenziei* as "Nyarling River, Mackenzie Dist."[2] Again, this is not a useful type locality because the Nyarling River is more than 100 km long.

The type material was collected on 4 and 11 July 1926 by J. Russell. According to Raup, John Russell was a Dominion Land Surveyor engaged in the first survey of this region in 1926.[4] Russell also collected plants that are reported by Raup. These plant collections include many grassland species from the "junction of the Nyarling and Little Buffalo Rivers." Since a perpetual calendar shows that the type material was collected on Sundays, it is reasonable to postulate that Russell collected the specimens while engaged in natural history studies in the vicinity of the survey party camp on his days of rest.

I was able to confirm this through copies of Russell's field notes kindly provided by G.E. Olsen of Energy, Mines and Resources Canada. The field notes confirm that Russell was camped "on the edge of a wide grass meadow" beside the Nyarling River about 0.8 km from its confluence with the Little Buffalo River from 4-11 July inclusive. Further, the field notes confirm that Russell did not engage in survey work on the dates that the type specimens were collected.

The type locality of *Coenonympha ochracea mackenziei* is therefore restricted to the Nyarling River, 0.8 km from its confluence with the Little Buffalo River, Northwest Territories (60°40' N, 113°25' W).

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Consider this familiar paradox of biological diversity: almost all the species that ever lived are extinct, and yet more are alive today than at any time in the past. The solution of the paradox is simple. The life and death of species have been spread across more than three billion years. If most species last an average of, say, a million years, then it follows that most have expired across that vast stretch of geologic time, in the same sense that almost all the people who ever lived during the past 10,000 years are dead though the human population is larger than it has ever been. The turnover would have been even greater if the grand pattern were dynastic, with one species giving rise to many species, most or all of which yielded to later ascendant groups. *Wilson, E.O. 1992. The diversity of life. W.W. Norton and Company, New York. 424 pp.*

NOTES & LETTERS

FIRST MARBLED MURRELET RECORD FOR ALBERTA

The Marbled Murrelet carcass pictured below was found by the author on the shore of Saskatoon Lake (NE/6-72-7w6) on 8 July 1994. No apparent cause of death could be determined. The carcass was forwarded to the Alberta Provincial Museum in Edmonton where it now resides as a skin.

- *Gavin Moore*, RR#1, Wembley, AB.

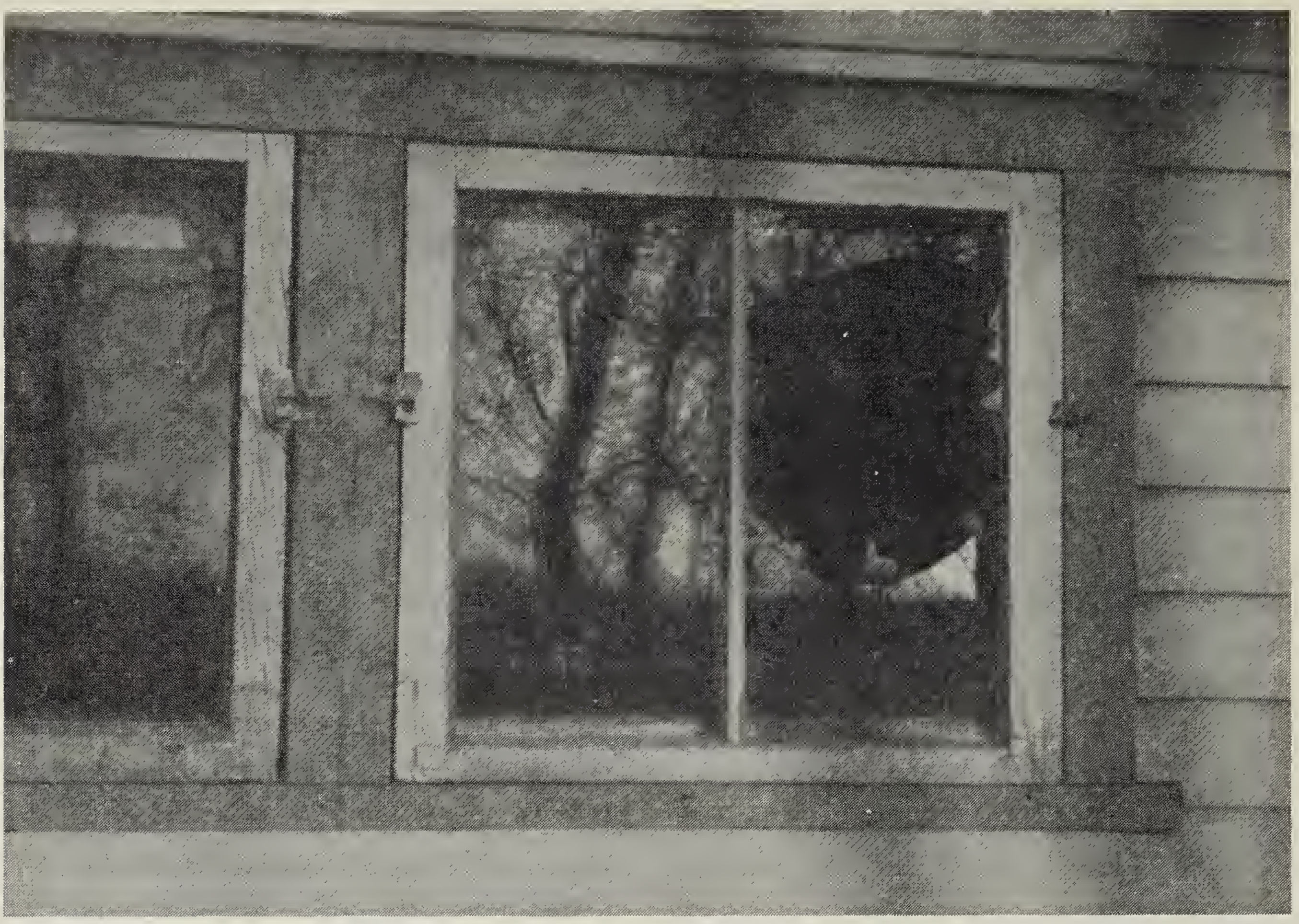
A DIFFERENT DRUMMER

The author has analyzed the crazy-flight phenomenon of the Ruffed Grouse in several articles, including nine grouse collisions with our farm home in the 1960s and 1970s.[2,3,4,5,6,7] The conclusion was that more than a dozen distinct conditions may contribute to the flight or even initiate it but they are always complemented by the underlying reason — the grouse's natural rocketing take-off and limited manoeuvrability. After a hiatus of 20 years, another grouse collided with the same house, and survived.

On 25 May 1995, shortly after 9:00 p.m. (the sun had already set), I entered our vacated, darkened farm house, three miles east of Rosthern. Scatter rugs askew on the living-room floor caught my attention, but not nearly as much as some movement up a far wall in the semidarkness. I was thinking "raccoon," but the fan-shaped tail identified the creature as yet another Ruffed Grouse.

I immediately went out, rather gingerly, not wishing to agitate the grouse into making a further "crazy" flight within the house. I left the living-room door and outer porch door open for its departure. My examination of the house's exterior revealed that the bird had gained entrance

Marbled Murrelet carcass found at Saskatoon Lake, AB *Dave Robertson*



A 1975 collision of Ruffed Grouse with farmhouse — same window, other pane. Both grouse survived. *Victor C. Friesen*

through a bedroom window, the left pane of the same window where another grouse had crashed through the right pane in 1975.[3] Both birds had broken through double panes of glass (10 x 20 in.) of storm and inside windows (see accompanying photograph).

When, after 10 minutes, no grouse had emerged, I re-entered the house, this time by way of the kitchen doorway. I heard some commotion in the adjoining living-room (all doors between rooms throughout the house had been left closed). Entering the room a second time, now from the kitchen, I saw the grouse perched on a curtain rod on the opposite wall. My appearance caused it to fly to the bedroom doorway and cling sideways to the 4.25 inch ventilation opening above the closed door.

The grouse, by its rapid movements and dexterity, seemed to be in fine fettle. The 1975 grouse, after its collision, had remained stunned for an hour before walking away; this one, fluttering about, was keeping pace to a different drummer, as Henry Thoreau would say. How many hours, or days, had it been imprisoned in the house since its collision? Who could say? And how had it got into the living-room from the bedroom in the first place? Only through the narrow opening above the door.

When I slowly worked my way around the grouse to herd it towards the outside exit, it sailed down to the chimney corner, where it now had a straight-ahead view through the open doorways. But it remained standing, assessing the situation, for another five minutes.

I, meanwhile, was talking to it in low tones, trying to prevent it from flying into something once more. We continued looking at each other, until I thought, like Thoreau again (in his encounter with a woodchuck), that we were beginning to feel mesmeric influences. Then, at a motion of my hand, it took off, with its typical exploding flight, safely exiting the house, although its stiff wing feathers clipped the porch doorway.

The next day I returned, in daylight, to put things aright and repair the broken window. The grouse, I found, might well have existed in the house for a few days, for it had tapped a food supply not usually found in a living-room. I had put out a dish of rolled oats and Warfarin, a mixture obtained from the rural municipality for combatting rats and mice. Containing nearly a capful, the dish was now completely empty, and there was no sign of any rodents who might have eaten it.

According to Bump and his associates, Ruffed Grouse may die after even minor injuries because of a disinclination to eat.[1] My grouse survived for several days; it not only ate readily but ingested a mixture poisonous to small mammals. The droppings throughout the living-room, even along the walls, told of its liveliness while captive in the house. In the interests of science, I counted the 134 "splats" in a room measuring 13 X 19 feet.

The bedroom, which it must have soon vacated and where there was no access to any food, had only one "splat." But in sweeping up the splinters of glass there, I counted some 160 feathers, mostly from the bird's ruff.

That a Ruffed Grouse could crash through a double window, fly up and squeeze through a narrow opening into a larger room, live on rolled oats and Warfarin for a period of time, then actively flutter about to elude a possible predator (the writer) before making its rocket-like escape — all bespeaks the hardiness of this splendid bird.

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- *Victor C. Friesen*, P.O. Box 65, Rosthern, SK. S0K 3R0

BAND-TAILED PIGEON AT MAREAN LAKE

I saw a Band-tailed Pigeon while on summer holidays at Marean Lake, in east-central Saskatchewan, on the west side of Greenwater Provincial Park.

While picking Saskatoons in the Gaetz cottage subdivision on 1 August 1995, a male White-throated Sparrow made alarm calls. A bird, crow size, flew from above and behind me. This caused even greater excitement from the White-throated Sparrow. "Ah, a Merlin," I thought, but it did not fly like a Merlin and landed in a Saskatoon bush. I stopped picking Saskatoons to concentrate on the bird. What are you? With binoculars in hand, I walked cautiously closer. The sun was bright, high over head, near 11:00

a.m. My first thought, viewing the bird with a pair of 8 X 42 Pentax roof prism binoculars, was a pigeon. The bird resembled a Rock Dove in the grey plumage, but with yellow feet and yellow black-tipped bill. Edging closer, I viewed the bird for about 10 minutes from 10 m, noting the iridescence behind the head down on to the back, white line between iridescence and greyish-purple head, darker wings, grey body and tail with a noticeable darker grey band in the tail. I thought ...B and-tailed Pigeon?

Not sure of the field marks, I hustled back to the cabin where the bird books were waiting. I looked through: *Birds of North America*, National Geographic Society; *Birds of North America* 1st ed. by Robbins *et al.* and *Field Guide to Western Birds* 3rd ed. by Peterson. These all confirmed that what I had seen was a Band-tailed Pigeon, a lifer, a long way from home given the range maps.

I set out again with a camera. Julie and Jeffrey, wife and son, back from a round of golf, also viewed the bird, now sitting sleepily in the shade in a White Birch. They both saw the field marks of yellow bill with a black tip and yellow feet, white stripe on back of head and band in the tail and compared the bird to one of the field guides. My two photographs, with a 50 mm lens at 50 m were disappointing. Several unsuccessful attempts were made to find the Band-tailed Pigeon until 11 August 1995 when we left Marean Lake.

Don Hooper does not list Band-tailed Pigeon in the *Birds of East-Central Saskatchewan*. This sighting adds a new species to the area. There have been ten additional sightings in Saskatchewan as reported in the seventh edition, *Field Checklist of Saskatchewan*, October 1990. This sighting is the most north-easterly record within Saskatchewan to date.

- *Ron Jensen*, 849 - 10th Avenue North East, Swift Current, SK. S9H 2T6

PARTIAL ALBINO MAGPIE

The grey and white Black-billed Magpie pictured below became a common visitor in the vicinity of the yard of Alec and Laila Johnson, two miles south of Archerwill throughout the summer and fall of 1995.

- *Elaine Hughes*, Box 309, Archerwill, SK. S0E 0B0

Partial Albino Magpie *Elaine Hughes*

FOXES IN SOUTH-CENTRAL SASKATCHEWAN

My father, Knut Jordheim homesteaded some 40 miles north of Swift Current, approximately 2 miles north of the South Saskatchewan River in 1908. I remember him mentioning "kit foxes" that would chew harnesses if left on the ground overnight. I presume these were actually Swift Foxes.

I was born in 1921 and in my early years I spent a lot of time in the nearby river breaks, never seeing or hearing of foxes in the wild. In 1930, a neighbour 1/2 mile south of our farm, started a fox farm with silver foxes and an occasional red fox brought in for crossbreeding to supposedly improve the silver colouring. A good silver fox was black with a generous sprinkling of white hairs over the black and a large white tip on the tail. Many of the progeny were a slate blue-black colour, and so, not a very valuable pelt.

There were reports of a fox escaping once in awhile, but I never saw any and at that time most farmers or their sons ran a trapline for coyotes, so an escaped fox would have a difficult time to survive. The fox farm enterprise came to a sudden end in 1941. During the 1950s a local man, now deceased, told me that he had been trapping foxes in the Kyle area, I assumed that it was north of Kyle.

My first contact with a wild Red Fox came on 17 November 1966 when it ran onto the road in front of my truck, 2 miles north of my present farm. The snow was perhaps 10" deep and the fox chose to stay on the hard track. I showed down to give it a chance to get off, but it would not, so deciding this was a good chance to destroy it, as I raised poultry, I stepped on the gas and drove over it, stopping immediately and picking it up. It was killed instantly and I found it was a female, weighing 10 pounds and measuring 44" in length.

During the 1970s and 1980s foxes became quite plentiful and I remember counting dens beside the road, from my farm in Kyle, a distance of 17 miles. No doubt there were many more that I was not aware of.

During the last few years we have been seeing foxes that are infected with mange and are not as plentiful in this area. During the 1920s and 1930s and into the 1940s there was an abundance of jackrabbits, then in the late 1950s and 1960s a great decline and I wonder if this is not due to the high population of foxes capturing the young rabbits.

- *Sig Jordheim*, Box 544, Kyle, SK. S0L 1T0

TURKEY VULTURES TO HUMMINGBIRDS: BIODIVERSITY AT SPARC

With 1995, came the 75th anniversary celebration of the Semiarid Prairie Agricultural Research Centre (SPARC), formerly known as the Swift Current Research Station. The number "75" was spelled out in white petunias against a red floral background in the "Horseshoe Garden," a well-known local landmark. The 4th of July festivities were honoured by the presence of Agriculture Minister Ralph Goodale. As the spouse of the current director and an avid birder, I wish to advertise another reason why this piece of government land should be cause for celebration.

I have had the privilege and pleasure to live on the Centre's grounds for the past year. The landscape that surrounds our house and nearby buildings resembles a lush oasis in the heart of pastures and cultivated fields. This is the result of a gradual change from semiarid grassland, 75 years ago, to a mixed region of park and prairie.

This concentration of greenery is also a magnet for birdlife, with an amazing richness of species diversity. I have counted 157 bird species to date, including 17 sparrows, 24 warblers and vireos and six types of thrush. Migration months have brought frequent surprise visitors. The Varied Thrush and Cape May Warbler both appeared briefly on 12 May 1995, a Black-throated Blue Warbler on 25 October 1994 and a Black-headed Grosbeak on 30 August 1995 stayed for several days during the fall. Even in the heart of summer, flocks of Red Crossbills and White-winged Crossbills took up residence in the spruce tops.

The Director's House serves as a wildlife blind and I have observed many birds foraging, unaware of my presence, as I peek out through windows. On the morning of 27 May 1995 I observed a male Mourning Warbler in his striking breeding plumage, just metres from the house, gleaning the garden for insects. A Lazuli Bunting on 12 June 1995 and a Solitary Vireo on 14 June 1995 were two birds whose spring songs led me to their whereabouts. The rarest bird I have seen here was a Barn Owl on 26 November 1994. However, without photographic evidence it is difficult to reinforce the validity of this sighting.

In addition to the cultivated land, pasture-land and irrigation ditches one would expect to find at an Agricultural Centre, the property offers a variety of other habitats for both breeding and transient birds. Within the 925 hectares, sloughs, remnant native prairie, a canopy of elms, spruce and lodgepole pines and an understorey of honeysuckle and berry shrubs supply generous food and shelter. From the cool shade of mature trees to the dry wind of open grassland, the dainty Ovenbird is replaced by the invisible Sprague's Pipit.

High biodiversity or "species density" within a community is often an indication of its richness and structural complexity. From my birder's perspective, the changes that have taken place since the Centre was established appear to be an enhancement for this area. In reality, the luxuriant growth of the Centre's wooded park is an artificial situation, maintained over the years through inputs of water and labour. Not a sustainable system — if left to fend for itself in semiarid Swift Current, the vegetation would begin to die off after several years of drought.

Nature Saskatchewan literature provides us with the alarming statistic that the province has lost 75% of its native mixed-grass prairie in the past 100 years. In 1921 this was also the land that was broken for experimental work. As I enjoy the results many years later, a question concerns me — is this really enhancement? Does quantity (157 species) outweigh quality? — the sacrifice of open space that could have been home to now endangered prairie species?

The Research Centre represents another example of the transformation of prairie habitat under the pressure of human development. In this case, however, the SPARC grounds may be considered environmentally friendly — as beneficial as the sheltering foliage found in coulee stands across the prairie. As a quasi Point Pelee of southwestern Saskatchewan, the varied habitats within the SPARC property offer valuable refuge to many birds on their migration route, just as Swift Current is an important stopover for human travellers.

The complete list of SPARC bird species many be obtained by writing to the author. I have also compiled a data base of daily recorded sightings of bird species in Swift Current as the beginning of a seasonal abundance checklist for this area.

- *Laure W. Neish*, P.O. Box 1937, Swift Current, SK. S9H 4M6

PEREGRINE VERSUS YELLOWLEGS

Galloway Bay which is located 10 miles west of White Bear was at one time farmland and some still is. When Lake Diefenbaker is full to capacity, many acres are flooded with shallow water, making it a popular gathering place for ducks, geese, cranes, shorebirds and also birds of prey.

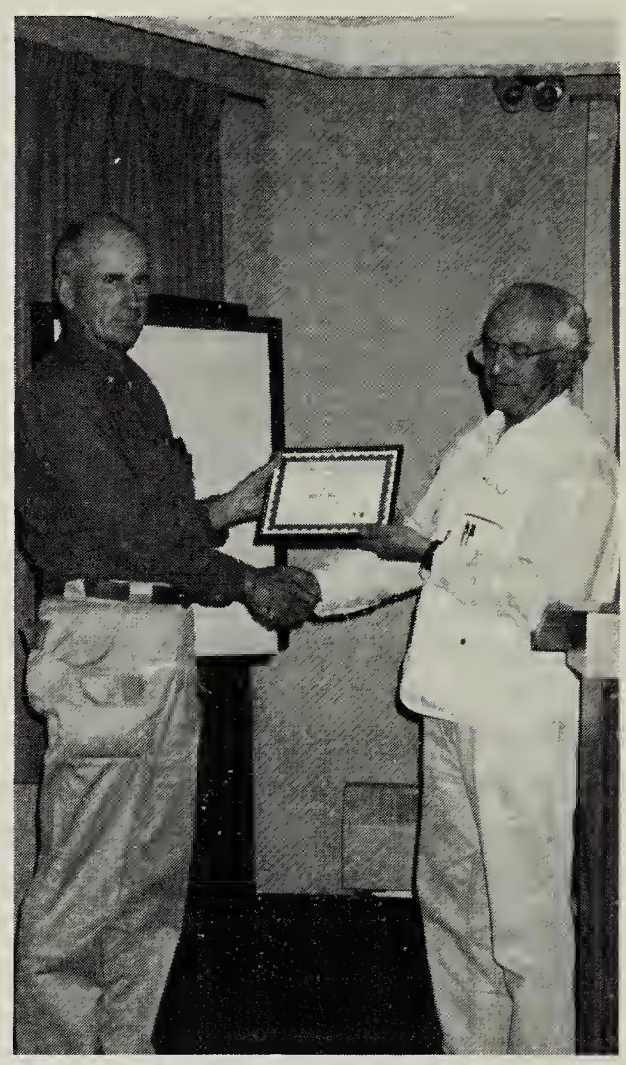
On 30 September 1995 I was parked at the shore of Galloway Bay viewing the hundreds of thousands of birds when I noted three Greater Yellowlegs feeding at the right of my vehicle. Suddenly these birds gave a cry of alarm and flew across the water directly in front of me. Down plummeted a Peregrine Falcon. Just when I expected to see feathers fly as the falcon was about to make contact with one of the yellowlegs, there was a splash and the peregrine zoomed upwards. The yellowlegs appeared again, almost immediately, and started flying. The falcon swooped and again at the right split second there was a splash of water and the falcon soared upward. Again the yellowlegs appeared above the water and commenced flying, and down came the falcon. This time I concentrated on the yellowlegs rather than the falcon as I wondered if it actually went underwater, and I saw that it was completely submerged.

This time a passing small bird, either a Horned Lark or Lapland Longspur got the attention of the peregrine and he gave it pursuit so the yellowlegs flew off to safety. The small bird managed to out manoeuvre the falcon.

- *Sig Jordheim*, Box 544, Kyle, SK. S0L 1T0

About the orchids of that place [rain forest] we knew very little. About flies and beetles almost nothing, fungi nothing, most kinds of organisms nothing. Five thousand kinds of bacteria might be found in a pinch of soil, and about them we knew absolutely nothing. This was wilderness in the sixteenth-century sense, as it might have formed in the minds of the Portuguese explorers, its interior still largely unexplored and filled with strange, myth-engendering plants and animals. From such a place the pious naturalist would send long respectful letters to royal patrons about the wonders of the new world as testament to the glory of God. And I thought: there is still time to see this land in such a manner. *Wilson, E.O. 1992. The diversity of life. W.W. Norton and Company, New York. 424 pp.*

The Cliff Shaw Award is given annually to the best article in Blue Jay, *as selected by the editor, during the previous twelve months. The 1995 recipient was Norbert G. Kondla for his article in Vol. 53, no. 1 entitled "Sulphur Butterflies of the* Colias alexandra *complex in Alberta."*



Keith Barr (left) received the Larry Morgotch Award from chief judge Frank Switzer (right). The award goes to the member with the best series of ten slides that tell a story.

Annual Conservation Award went to the Yorkton Natural History Society and Ducks Unlimited Canada, Yorkton. Members of the Yorkton NHS were present to receive the award. Left to right: Warren Hjertaas (President), Elenor Hjertaas, Shirley Jowsey and Jim Jowsey.

"Auctioneer" Lorne Scott, MLA, doing his best to pry loose a few dollars for a good cause. Over $600 was raised at the auction.

The passing of the gavel, or "chickadee," to the incoming President, Bob Berthiaume (right) by First Vice-President, Paul Chytyk (left).

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The *Blue Jay* is the journal of Nature Saskatchewan and publishes articles of scientific or general interest dealing mainly with the northern prairie area. Papers are accepted from members of Nature Saskatchewan or any other interested individual. Reporting of any observation of significance in the field of natural history is encouraged. The *Blue Jay* is classed as a semi-refereed journal. All submissions are reviewed by at least one individual competent in the field plus the editor.

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